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ANNUAL

OF THE

UNIVERSAL MEDICAL SCIENCES

A YEARLY REPORT OF THE PROGRESS OF THE GENERAL
SANITARY SCIENCES THROUGHOUT THE WORLD.

EDITED BY

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AND CORRESPONDENTS.

Illustrated with Chromo-Lithographs, Engravings and Maps.

VOLUME V.



1894.

THE F. A. DAVIS COMPANY, PUBLISHERS,

PHILADELPHIA, NEW YORK, CHICAGO.

LONDON: F. J. REBMAN.

AUSTRALIAN AGENCY: MELBOURNE, VICTORIA.

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Philadelphia, Pa., U. S. A.
The Medical Bulletin Printing House,
1916 Cherry Street.



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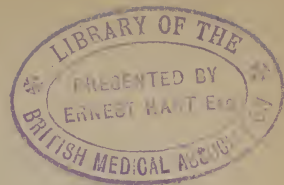
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GENERAL THERAPEUTICS AND PHARMACEUTICAL CHEMISTRY.

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Aceto-ortho-toluide.—This substance appears in the form of colorless needles, freely soluble in alcohol, ether, and hot water, but little soluble in cold water. Its melting-point is 107° C. (224.6° F.), and boiling-point 296° C. (564.8° F.), being comparable in these respects to acetanilid and methylacetanilid, which it resembles chemically, being also, like these drugs, an active antipyretic. Experiments made by Barbarini ⁸¹⁴_{Feb.} on animals show that it is superior both to acetanilid and methylacetanilid in being less toxic. The dosage is not given.

Agathin.—Ilberg ⁶⁹_{No.5} has studied the antineuralgic and anti-rheumatic action of agathin. He began by giving 0.25 gramme (4 grains) three times a day and gradually increased the amount to 0.50 gramme ($7\frac{3}{4}$ grains) five times in twenty-four hours. The usual dose was 0.50 gramme ($7\frac{3}{4}$ grains) three times a day. His results were not encouraging. Of eight patients suffering from various neuralgias only one (a case of sciatic neuralgia) was cured on the fourteenth day. In acute articular and blennorrhagic rheumatism the results were also negative. In one case of chronic rheumatism the improvement was not more marked than if the patient had remained in bed for fifteen days. The untoward symptoms were frequent and varied. Most of the patients complained of cephalalgia and a feeling of heaviness. Insomnia, vomiting, diarrhœa, smarting pain during micturition, sensation of heat and intense thirst were also observed. The author believes that agathin should be rejected as an analgesic, and that its use may cause dangerous symptoms. L. Badt ⁶⁹_{No.16} agrees with Ilberg as to the ill effects of the drug. In a woman suffering from sciatica,

to whom he had prescribed 0.5 gramme ($7\frac{1}{2}$ grains) twice a day, he observed headache and vertigo on the second day; and on the third day, upon the taking of 0.5 gramme ($7\frac{1}{2}$ grains) in the evening, vomiting and loss of consciousness ensued. Badt found the drug of no value in this case, as well as in another case of chronic muscular rheumatism.

Alangine.—Mohideen Sheriff<sup>953
No.2</sup> has studied this substance, which is the active principle of *Alangium Lam.* It is amorphous, very bitter, soluble in alcohol, ether, and chloroform, and absolutely insoluble in water, precipitated in crystalline salts by the mineral acids, and also by acetic, tartaric, and oxalic acids. An alcoholic solution being allowed to evaporate, the alangine is deposited in the form of a yellowish, amorphous substance, similar to varnish. Alkalies being added to an acid solution of this alkaloid cause its precipitation in white flakes. It is also precipitated by the ordinary reagents of alkaloids. There is no colored reaction upon the addition of concentrated sulphuric acid, either pure or combined with bichromate of potassium. Nitric acid colors it reddish brown; slightly heated, a nitrous vapor is formed, and the coloring becomes clearer. The bark of the alangium, in doses of 3 grammes (46 grains), is an excellent emetic; in small doses it acts as an antipyretic. It may replace ipecacuanha, except in dysentery.

Alcohol.—An opinion prevails among the laity, and is largely accepted by physicians, that alcohol has no hypnotic action except in large doses, while in medium-sized doses it exercises exclusively an excitant influence. Physiologists and pharmacologists, on the other hand, affirm that alcohol, introduced into the blood, always depresses the functions of the nervous system. Harnack<sup>34
Feb.23</sup> considers both opinions too systematic; in reality alcohol in small or medium doses exercises simultaneously a stimulating action upon certain functions and a depressing action upon others. This fact should never be lost sight of, otherwise the physician exposes himself to the danger of injuring instead of benefiting his patient. It should also never be forgotten that, even in small doses, the paralyzing action of alcohol is exercised most rapidly and most energetically upon the tonus of the blood-vessels,—the importance of which tonus for the regularity of the circulation and the preservation of cardiac energy is well known. For this reason alcohol should be given with caution in cases in which the heart is already enfeebled,

as in acute diseases of long duration, or in convalescence from such affections. It sometimes happens that the patients themselves refuse alcoholics; in which case they should never be compelled to take them, but should be given digitalis instead, which even in small doses (0.3 gramme— $4\frac{1}{2}$ grains—in 180 grammes—6 ounces—of water) acts solely upon the heart, but in this way establishes the tone of the blood-vessels. The acceleration of pulse often observed after the administration of digitalis is doubtless due to the improved nutrition of the cardiac muscle.

Alumnol.—A. Kontz ¹¹³_{No.13} has used alumnol in sixteen gynæcological cases: catarrh of the neck, endometritis with or without inflammation of the annexes. Cervical catarrh and simple perimetritis are very easily cured by its repeated use. In endometritis complicated with lesions of the annexes, however, the pains are augmented on account of the irritation produced. Blennorrhagic vaginitis is readily cured by this remedy. The author has made use of the following preparations: A solution of 3 per cent. for lavages; a powder and bougies of 20 per cent.; a 10-per-cent. solution as an astringent in the treatment of endometritis and of erosions. Gauze soaked in a 24-per-cent. solution has also rendered good results, but care must be taken not to leave it in place more than twenty-four hours, as it then takes on a very fetid odor. M. Chotzen ⁴_{No.48, '92}; ²_{Dec.17, '92} has tried alumnol in more than 300 cases, finding it efficacious in acute superficial inflammatory affections of the skin, as well as in chronic processes in which the inflammation was deeper; in parasitic diseases, such as erysipelas, favus, lupus, soft chancre, erosions, and gonorrhœa; and in acute and chronic inflammations of the mucous membrane.

L. Casper ⁴_{No.13} has tried the drug in 12 cases of acute blennorrhagia, 20 chronic cases (in 8 of which gonococci were present), 4 cases of blennorrhagic epididymitis, 2 of post-blennorrhagic adenitis, and 2 of soft chancre. In the first cases mentioned, treatment was begun by intra-urethral injections of a 1- to 2-per-cent. solution of alumnol three times daily. Later the same solution was used once daily, or else a feebler solution (from 0.25 to 1.00 per cent.) several times during the twenty-four hours. In 8 cases treatment was begun from one to three days after the appearance of the secretion, and from three to ten days in the other 4 cases. The drug was not found superior to any other drug generally used.

In chronic blennorrhagia it was found inferior to nitrate of silver. Only in the cases of soft chancre did cure result from its use. E. Samter⁴_{No.13} has had the same experience in twelve cases treated by him, which had not been submitted to any other treatment. In some cases it seemed even to aggravate the affection. He refuses to admit that it has an antiblennorrhagic action, as claimed by Chotzen. A sufficient number of cases have not yet been treated by the drug to warrant a judgment upon its merits; but in view of the invariably unfavorable results reported, there seems to be little to expect from its use, until further researches show why there should be such a difference between the results obtained by Chotzen and those of other physicians.

J. Eraud, of Lyons,²¹¹_{Oct.30} has tried it in the dressing of wounds and in ulcerations of specific or non-specific character. No irritation or pain followed its use. It may even be said that it is as efficacious as other powders for the desiccation of wounds. It appeared to be useful in certain varieties of pruritus, especially that of the anus and scrotum. Eraud also employed it in acute and subacute blennorrhagia, in doses of 1 to 2.50 grammes ($15\frac{1}{2}$ to $38\frac{3}{4}$ grains) to 100 grammes ($3\frac{1}{4}$ ounces) of distilled water. Its effects were neither inferior nor superior to those of other substances recommended for the same purpose. In no case did it augment or decrease the process of inflammation. It is not incompatible with sublimate, resorcin, etc., and may be combined with them in order to strengthen their reciprocal action, as there is a tendency at the present time to believe that the action of several antiseptics combined is more marked than when each is separately employed.

Amber.—Essence of amber is praised by William Murrell,²_{Apr.1} who regards it as an excellent rubefacient and local irritant in rheumatism, lumbago, and sciatica. In England essence of amber (oleum succini) is a popular remedy in whooping-cough, being rubbed over the vertebral column morning and evening. Frictions of the chest may also be employed in beginning pulmonary tuberculosis and in chronic bronchitis. Internally 10 to 20 drops, in emulsion or in capsules, may be used in flatulent dyspepsia and globus hystericus. Wood has recommended it in hiccough. Murrell cites a case proving that the substance is not harmless and must be used with some care. A pregnant woman swallowed a

tablespoonful of essence of amber. Violent vomiting and diarrhœa ensued, with general weakness and abortion. The formula for external use is as follows: Essence of amber, camphorated alcohol, alcohol of volatile salt of stag's horn, each equal parts. Essence of amber is the product of dry distillation of crude amber, a colorless or slightly yellowish liquid, with an intensely disagreeable odor.

Amylene Hydrate.—E. Harnack and H. Meyer⁵⁴_{No.8} call attention to this drug as an active antipyretic in warm-blooded animals (dog, cat, rabbit, and guinea-pig), being in this superior to all other narcotics. The smaller the animal, the more marked the fall in temperature, which sometimes is as much as 11° C. (19.8° F.),—from 38° to 27° C. (100.4° to 80.6° F.). Without doubt, this lowering is due to the direct action of the drug upon the thermic centres; at all events, the dilatation of the vessels is less pronounced than after the administration of chloral hydrate. In man, however, amylene hydrate does not influence the temperature to any degree, even in fever, and clinical observations are necessary to prove its value. It acts but feebly upon the respiration, heart, and vessels of warm-blooded animals; in man the sphygmograph shows some modifications in the pulse-curve; while experiments made upon the isolated frog's heart and the muscles in general, show it to be a muscular poison; the muscles, at first excited, become paralyzed. It may be regarded as an excellent antidote to all convulsants, especially when the convulsions are of cerebral origin (as in poisoning by santonin). It is also regarded as an antiepileptic. Given internally, it diminishes the elimination of urea; but, administered subcutaneously, it augments its elimination. This latter phenomenon is due to its local irritating action (phlegmonous inflammation, abscess, or necrosis of the tissues).

J. Meiser⁵⁴_{No.1} has made some researches on the variations presented in the elimination of nitrogen in man under the influence of chloral hydrate and amylene hydrate. He found that the action of amylene hydrate was entirely opposite to that of chloral hydrate, the latter increasing the quantity of nitrogen eliminated by the urine, the former lessening it about 2 grammes (31 grains). That excreted by the fæces showed no change. It is to be seen, therefore, that amylene hydrate prevents the destruction of albuminous substances, and that it is preferable as a narcotic to chloral hydrate whenever the hypnotic effects are to be

continued for a long time, and in all affections in which there is an exaggerated decomposition of albuminoids; fever, more or less intense; very pronounced dyspnœa; anæmia and hectic diseases, especially pulmonary phthisis and diabetes; and also cases of digestive troubles with concomitant anorexia.

Analgene.—Spiegelberg³¹_{Apr.4} has tested the antineuralgic action of analgene in 22 cases, with satisfactory results. In 10 cases of simple neuralgia there were 8 recoveries, the 2 failures being in hysterical subjects. In 3 cases of migraine, 1 was cured and the other 2 (hysterical) were rebellious to analgene. It failed, also, in 1 case of zona and in 2 cases of tabetic pains, as well as in 2 cases of uric arthritis. On the other hand, it succeeded in 3 cases of rheumatic pains (1 chronic articular rheumatism, 1 acute muscular rheumatism, and 1 case diagnosed as neuritis) and in 1 case of bronchial asthma. As to untoward secondary symptoms, the author observed intense headache in 1 patient and pains in the head and buzzing in the ears in others. The patient should be informed of the red discoloration of the urine, lest this phenomenon should frighten him. Analgene presents an advantage over antipyrin in that it is insipid in taste.

Aniline Dyes.—S. Parewski and S. Blatteis¹¹⁶_{Jan.} fully confirm the antimalarial action of methylene blue, as claimed by Ehrlich and Guttman. They prescribe it in subcutaneous injections of 0.02 gramme ($\frac{1}{3}$ grain) in the beginning, and later in doses of 0.10 gramme ($1\frac{2}{3}$ grains) daily or, by the mouth, in cachets of 0.40 to 0.50 gramme (6 to $7\frac{3}{4}$ grains) two or three times daily. To avoid accidents, only a perfectly-pure quality must be employed. The paroxysms of fever ordinarily cease after from three to five injections or after 15 cachets have been taken. The size of the spleen diminishes during the treatment, the plasmodiæ resisting longer, but finally disappearing. It is to be noted that the semilunar plasmodiæ are much more resistant than the endoglobular. Tolerance is easily established, so that the vomiting which usually follows the first dose does not occur after the second or third. For the same reason, relapses after treatment by methylene blue do not yield as readily to this drug as to quinine; but, on the other hand, the relapses after quinine treatment are much more amenable to treatment by methylene blue. The epiphenomena of malaria, such as headache, gastralgia, lassitude, etc., yield much

more rapidly to methylene blue than to quinine, while the supra-orbital neuralgia and rheumatoid pains are also favorably influenced. As regards relapses, the drug does not insure the patient against them any more than does quinine. Dabrowski^{586 No. 11} is assured of the favorable action of methylene blue in quotidian intermittent fever by his experience in six cases of the disease. The dose given was 0.5 gramme ($7\frac{3}{4}$ grains) daily, in four portions. In five cases the disease was cured after several days' treatment, the spleen resuming its natural size and the plasmodiæ disappearing from the blood. In the sixth case there were three attacks of fever during the treatment, and on the sixth day plasmodiæ were still present. There were no secondary symptoms; the patients bore the remedy well, excepting in one case, where nausea and vomiting occurred on the eighth day, but ceased immediately on the suspension of the drug. The author believes its favorable action to be due not to the fact that it exercises any direct influence upon the plasmodiæ, but that it modifies the constitution of the blood, thus making it unfavorable for the growth of micro-organisms. A. Darier, of Paris,^{206 July} has shown to the Dermatological Society of Paris five patients with epithelioma of the eyelids who were cured in a very short time by successive local applications of methylene blue and chromic acid. The applications are not painful, and result in a speedy cure without leaving deforming scars. This treatment is highly recommended for all benign forms of superficial epithelioma where surgical intervention is objected to. Preliminary to the applications it is necessary to remove all the crusts covering the surface of the neoplasm, which may be accomplished by the aid of antiseptic poultices; the portions to be treated should then be anæsthetized by the application of compresses saturated with a solution of cocaine. The diseased portion should then be painted with the following:—

R Methylene blue,	. . . . .	1 gramme (15 grains).
Alcohol,	. . . . .	5 grammes (75 grains).
Glycerin,	. . . . .	5 grammes (75 grains).

All of the surface stained blue should then be touched with a steel probe dipped in a 1-to-5 solution of chromic acid. A purple-color reaction occurs. The applications are to be repeated at intervals of four days, and the treatment is to be continued for three weeks or two months, according to the extent of the disease.

Richard d'Aulnay, of Paris, ⁶⁷_{No. 18} has used methylene blue with success in blennorrhagic vaginitis. He has always found the treatment to succeed after three or four days, the pains diminishing from the beginning of the application. The remedy has the inconvenience of staining the linen, but, in comparison with the advantages presented by it, this is of slight importance; it may, besides, be obviated by suitably closing the vaginal orifice. The application is made as follows: The patient is first examined by means of the speculum, and the vaginal cavity cleansed with a sublimated solution and with absorbent cotton, after which tampons saturated with the following solution are introduced: Methylene blue, 10 grammes ($2\frac{1}{2}$ drachms); alcohol, 15 grammes ($\frac{1}{2}$ ounce); potassium, 20 centigrammes (3 grains); water, 200 grammes (7 ounces). The orifice is closed with a dry tampon, and the application is left in place during two days; it is then withdrawn, and the parts washed with the sublimate solution, then glycerin tampons are applied. The cure, after this, is usually complete, and only one or two emollient applications need be made. (See also Pyoktanin.)

Animal Extracts. — Brown-Séquard and d'Arsonval, of Paris, ⁹²⁰_{Apr. 24} give the following results obtained by the injection of testicular juice: Locomotor ataxy, 342 cases; improved or cured, 314; other medullary sclerosis, 8 to 9 per cent. improved or cured; pulmonary tuberculosis, 8 per cent. improved; superficial cancer, 103 cases, almost all improved; paralysis agitans, 27 cases, 25 improved; diabetes, almost always improved. Many chronic affections were also much improved. Neurasthenia was rebellious to the treatment in half the cases. The authors reached the following conclusions: 1. Although testicular liquid possesses no direct curative influence on the various morbid conditions of the organism, it may by injection under the skin cause the cure or considerable improvement of organic or non-organic affections of the most varied character, or at least cause their effects to disappear. 2. These actions of the liquid are brought about in two ways: the nervous system, gaining in force, becomes capable of ameliorating the dynamic or organic state of the diseased parts, and, by the entrance into the blood of new material, new cells or other anatomical elements are formed, thus contributing to the cure of the morbid condition.

Ouspensky, of Tiflis, ⁹²⁷_{Nov. 5, '92} treated 10 cases of grave cholera by means of testicular injections. His results were most encouraging, for only 2 of the patients died, while all other similarly serious cases ended in death. He believes that large doses are necessary in cholera.

Augagneur ⁸⁷⁴_{May 27} calls attention to the fact that it is difficult to cure trichophyton tonsurans before the age of puberty, and that in adults the disease is unable to progress and produce the characteristic scurf. He therefore suggests that this immunity of the adult is due to a modification of tissue resulting from genital development, and suggests that it is possible to hasten this tissue-change by testicular fluid. He has made a practical test of his theory, and has found that the patients are much benefited thereby. No positive cures have resulted.

Dujardin-Beaumetz, of Paris, ¹⁴_{Mar. 19} states that it is incontestable that suggestion plays a considerable rôle in this method, when the patients to whom it addresses itself are considered. Its author is wrong in exaggerating its value. It has been said to cure tabes, then cholera, then cancer of the stomach, not to mention a trifling disease like diabetes. Charcot, however, waited in vain for the cure of a single case of true ataxia in his service. How could it be otherwise where such organic lesions were concerned? That which is destroyed is lost, and all the organic liquids are of no avail. Besides, even the exact agent of these liquids is to such a point unknown that, according to some, it is the phosphate of soda, and according to others phosphorus. The truth is that injections of organic liquids have generally a tonic effect, but here their ambition should end.

Bérillon, of Paris, ¹⁴_{June 4} says that, as far as locomotor ataxy is concerned, testicular liquid acts by suggestion, and that this suggestive influence is all the more manifest because for the most part ataxic patients are doubly hysterical. The symptoms which are cured in these ataxics are precisely those dependent on hysteria.

Bouffé, of Paris, ¹⁴_{June 4} believes that in certain cases it is wrong to attribute the curative effects of the testicular liquid to suggestion. He cites the results in certain animals and the physical modifications observed in patients, such as slackening of the pulse, increase of muscular power, etc. He considers the curative results to be due to a special substance, and not to the phosphate of soda

contained in the liquid. According to the observations of the author, the testicular juice acts by giving to the nervous system a force which it lacks. As regards ataxia cured by this method, one must admit the disappearance of the symptoms, even if the lesion be not cured. In any case, testicular liquid is a therapeutic agent of great power, which cannot be replaced by other liquids to which analogous properties are attributed.

Jolly, of Paris, ¹⁴_{May 3} concludes that, though the injection of testicular liquid exercises a stimulating action on the nervous system which may be of utility in certain cases, this stimulation being but momentary, most often has the effect of still farther enfeebling the system by increasing the expenditure of phosphates. The true and rational general treatment of nervous diseases consists in returning to the organism the phosphates which have become diminished.

Guelpa, of Paris, ¹⁴_{Apr. 16} states that if the injections were followed by the use of neutral glycerin an improvement took place. The same was the case in patients treated only by injections of diluted glycerin or of phosphate of soda, as well as in those to whom the broiled organs were administered at meals. Is not this the best proof that the effects are due to suggestion?

Héricourt, of Paris, ⁹²⁷_{Apr. 29} presented a note upon the comparative use of the testicular juice and its substitutes,—phosphate of soda, artificial serum, gray cerebral substance, and spermin. The patient on whom Héricourt experimented with these liquids was a convalescent from influenza in very poor condition. Following each injection of testicular fluid, dynamogenic effects were always observed; after the use of other products no such effects were noticeable. As the patient was ignorant as to which substance was employed, suggestion had no causative influence. Brown-Séquard added to this communication that Poehl's spermin was an ill-defined substance, and that, at all events, it did not exist in the testicular liquid prepared at the College of France. He also denied the value of the cerebral fluid derived only from sheep.

Magugliani, of Pavia, ¹¹⁰²_{May 1} has experimented with testicular juice in patients suffering from neurasthenia, hysteria, pulmonary tuberculosis, and locomotor ataxy. He arrives at the following conclusions: (1) testicular juice has no physiological or therapeutic action upon the human organism; (2) especially is there

no action on the dynamometrical forces; (3) it may have an irritating local action; (4) whatever effects are observed, ephemeral and illusory, they should be attributed to the accidental variations of the disease, and principally to the action of suggestion.

V. Negel, of Jassy, ²²³_{Nov. 1, '92} after a series of clinical experiments with gray cerebral substance and testicular liquid, has arrived at the conclusion that, in the great majority of cases, the organic extracts act only by suggestion; for example, the author observed that sterilized water produced exactly the same effects as brain-substance, when injected in neurasthenia and hemiplegia.

Chabrié, of Paris, ¹⁴_{Aug. 30} has examined the urine of patients subjected to the injection of testicular fluid, both before and after the treatment. He noted that there was a considerable increase of urea after the injections; he also noted that there was a decrease of phosphoric acid whenever there was an increase of urea, and *vice versâ*. The quantity of urine was not modified by the injections. The diminution of phosphaturia was undoubtedly due to the testicular fluid, for it was not caused by artificial serum. This point is of interest in view of the danger of phosphaturia in nervous patients.

Poehl, of St. Petersburg, ⁸⁶⁰_{Aug. 15} has extracted from the testicular juice of Brown-Séguard a base analogous to spermin, isolated for the first time in 1878 by Scheiner; and he is convinced that this spermin is the active principle of the emulsion of Brown-Séguard. On this point many physiologists are in accord with his views. He also shows that this substance is found in most of the other organs of the body,—ovaries, pancreas, thyroid body, thymus, spleen, and normal blood. According to him it plays an important rôle in the organism, acting as a ferment of oxidation. It oxidizes the excrementitious products of the body, especially the leucomaines, and prevents their accumulation by transforming them into substances more easy of elimination.

R. Massolongo, of Padua, ⁵⁸⁹_{Nov. 4, 6, 7, 8} has had but negative effects in his experiments, and attributes any effect they may produce to the imagination, or to suggestion.

C. L. Dana, of New York, ⁹⁹_{May 18} believes the method to be a rational one, and that there is no more reason to doubt the value of animal extracts than there is to doubt that of vegetable extracts. The remarkable effects obtained by thyroid juice in myxœdema

are ample justification of this opinion. Dana cites a case of bulbar paralysis entirely cured by injections of brain-extract; also cases of ataxia and epilepsy in which great improvement took place.

Hammond^{40 43 110} gives in detail the method of preparing cerebrin, and his results in various diseases. He is convinced that an enfeebled organ may be always relieved by the extract of a similar healthy organ. He insists upon the necessity of preparing the organs according to his method, lest the fluids be inactive, or, at times, even dangerous.

J. S. Leonhardt¹_{June 1} disputes the conclusions of Hammond, and especially attacks the results obtained by the use of cardin. According to him, the sphygmographic tracings obtained by Hammond must not be interpreted as the author interprets them, but may be easily explained as due to ordinary heart-lesions. He ridicules the use of organic extracts. Hammond replies by maintaining his first conclusions, and by again insisting upon the importance of the method of preparation.

D'Arsonval, of Paris,⁴¹⁰_{Jan.} gives the latest formula employed at the laboratory of the College of France to obtain concentrated testicular extract. This may serve as a model for the preparation of all other organic extracts intended for subcutaneous injection. It may be briefly given as follows: Take the testicles of the bull, divide each into four or five portions. Macerate for twenty-four hours in glycerin at 30° C. (86° F.), in the proportion of 1 litre (quart) per kilogramme (2 pounds) of testicle. Add 5-per-cent. salt water, $\frac{1}{2}$ litre (pint) to 1 kilogramme (2 pounds) of glycerin. Mix and allow to macerate half an hour. Filter through Laurent paper No. 8, and sterilize the filtered liquid either by carbonic acid (sterilized filter, or an autoclave with carbonic acid without filtration through porcelain) or by filtration with aluminium without carbonic acid (a process inferior to the others, but simpler and within the reach of practitioners). The quantity of liquid from 1 kilogramme (2 pounds) of testicle in the glycerin varies from 600 to 500 grammes (19 to 16 ounces). The quantity of glycerin is brought back by the addition of salt water at about 15° Baumé. The liquid, in flasks containing 30 grammes (1 ounce), well-corked and previously well washed in boiling water, keeps for several months without alteration. This liquid, according to Brown-Séquard and

d'Arsonval,⁴¹⁰_{p.192} must be injected under the skin, not pure, but one-half diluted with water recently boiled and cold. If the injection be painful, the liquid should be further diluted with water (10 to 40 drops). All vessels employed, as well as the syringe, cannula, skin of the patient, and fingers of operator should be carefully washed in 2-per-cent. carbolized water before and after injection. At least 2 grammes (31 grains) of the diluted fluid should be daily injected, and even 5, 6, or 8 grammes ($1\frac{1}{4}$, $1\frac{1}{2}$, or 2 drachms), diluted, or else 4 to 8 grammes (1 to 2 drachms) should be injected in several places twice a week, preferably into the abdomen, between the shoulders, or into the buttocks. The treatment should be continued three weeks, and for some affections, such as myelitis and sclerosis of the cord, the time cannot be limited, but may be two or three months. Water should never be added to the liquid in the flask. The injections should be suspended if untoward effects are observed. The remedy may also be given *per rectum*. (See also Transfusion.)

Antinervin.—Laurenti¹¹³_{Feb.12} has tried antinervin (salicyl brom-anilid) on more than fifty patients, most of whom were affected with various catarrhal diseases, and some with affections of the nervous system (neuralgia, chorea). The drug may be administered in cachets, first of 0.50 gramme ($7\frac{3}{4}$ grains) four times a day, and afterward in doses of 1 to 1.5 grammes ($15\frac{1}{2}$ to $23\frac{1}{4}$ grains). The absorption is very rapid, and after thirty-five to forty minutes the presence of salicylic acid can be detected in the urine; traces of the drug can also be found five or six hours after its administration. From the first two doses its favorable action is shown upon the headache, and the lumbar, articular, and muscular pains. The temperature remains unchanged, in contradiction to the assertion of authors that its administration in doses of 1 or 1.5 grammes ($15\frac{1}{2}$ to $23\frac{1}{4}$ grains) is followed by a lowering of the temperature 1° to 1.5° C. (1.8° to 2.7° F.). Antinervin is most active in cases of articular rheumatism and influenza. It can be prescribed also with success in cases of hyperexcitability of the nervous system. It is antineuralgic, antirheumatic, and antipyretic, and without dangerous secondary effects, even after doses proportionately large.

Antipyrin.—Cazeneuve, of Lyons,²¹¹_{Jan.3} gives the results of his experience with antipyrin in otitis and cystitis. Although the

drug has no marked antiseptic qualities, the author believes that it may be of use in this respect, by attenuating the soluble ferments, even in therapeutic doses. The action of antiseptics differs according as it is exerted *in vitro* or upon the organism. Iodoform and salol give mediocre results *in vitro*, and yet are excellent antiseptics. Cazeneuve has had encouraging results from the use of antipyrin. In suppurative otitis an aqueous solution of 4 grammes (1 drachm) of antipyrin to 16 grammes ($4\frac{1}{4}$ drachms) of water had as good effects as menthol. In cystitis with ammoniacal urine two injections of a 4-per-cent. solution were made daily, of 0.70 gramme ($10\frac{3}{4}$ grains) each. The pain was diminished and the character of the urine modified.

Cappelletti ⁵⁹¹_{Mar. 31} records the case of a somewhat-hysterical girl of 23, who began to take small doses of antipyrin for the relief of headache. Contrary to the advice of her doctor, she steadily increased the amount, till at last she took as much as 8 grammes (2 drachms) daily. At this time her health began to suffer seriously; the least provocation or contradiction brought on a violent hysterical convulsion; she lost appetite and all interest in domestic matters; her headaches increased, and to them was added a buzzing in the ears; she appeared like a person half asleep. The large doses of antipyrin which she was taking afforded only very transient relief, but she would not brook either the least reduction in amount or even any delay in administration, complaining of great pain and becoming excited if the dose were delayed even for an hour. At this time she entered an asylum with the desire of being cured. Here an attempt was first of all made suddenly to reduce considerably the amount given, but this gave rise to such prostration that it was found necessary to treat the case like one of morphinomania, there being a great similarity between the two conditions. But every reduction, whether made with or without the patient's knowledge, produced much constitutional disturbance, and it was found necessary to have recourse first of all to large doses of potassium bromide, and later on to caffeine. The two main troubles were the insomnia and the loss of appetite, but these were gradually overcome, and the patient at length left the asylum completely cured, both of the headaches and also of her craving for antipyrin.

Rondot, of Bordeaux, ²¹²_{Feb. 25} has devoted a brochure to the sub-

ject of antipyrin, giving in detail the accidents to which its use may give rise, especially when employed in doses of some size, and in feverish patients.

Antiseptine.—Squibb ⁷⁴⁴_{Apr.20} states that antiseptine (iodo-borothymolate of zinc), introduced some time ago as a definite compound, is but a simple mixture containing sulphate of zinc, 85 parts; boric acid, 10 parts; iodide of zinc and thymol, each $2\frac{1}{2}$ parts.

Antispasmine.—This drug, much praised by Demme, ⁸²_{Mar.18} is composed of one molecule of sodic narceine and three molecules of salicylate of sodium, forming a white powder easily soluble in water, and containing about 50 per cent. of pure narceine. The advantages of antispasmine are its great solubility in water and the purity of the narceine which it contains. According to Demme, it is an excellent hypnotic and analgesic in all spasmodic painful affections. It can be used for children, as it presents none of the dangers of other opiates. It acts favorably in whooping-cough and relieves cough in general, both in children and adults. The following formulæ are given by Demme:—

1. Whooping-cough and stridulous cough in children: Antispasmine, 1.15 grammes ($17\frac{1}{2}$ grains); cherry-laurel water, 15 grammes ($\frac{1}{2}$ ounce). To be taken two or three times daily, 15 drops on a bit of sugar or in water. 2. Cough in adults: Antispasmine, 0.5 gramme ($7\frac{1}{2}$ grains); cognac, syrup of red currants, distilled water, each 30 grammes (1 ounce). Dessertspoonful three times a day.

Aristol.—Moncorvo ⁶⁷³_{Oct.,'92} has used aristol externally in more than one hundred infantile cases, the drug being carefully rubbed up in vaselin in variable proportions, and has given it internally in cachets to tuberculous children, in maximum daily doses of 0.40 gramme (6 grains). In all these cases it proved a perfect substitute for iodoform, over which it has the advantage, at least for internal use, of being tasteless. When given internally it produced no toxic symptoms; as an antiseptic it diminished suppuration and hastened the cicatrization of wounds and ulcers; it was found of great value in many infantile skin diseases. He concludes that it may be used in every way as an efficient substitute for iodoform, with this advantage, that it is without odor.

J. Ochs ¹¹⁶_{Jan.} has tried subcutaneous injections of aristol in six

cases of phthisis, using a solution of 1 per cent. in mild almond-oil, in doses of 1 cubic centimetre ($15\frac{1}{2}$ minims). These injections were not toxic, but very painful, the pain sometimes continuing throughout the entire day. They did not favorably influence the tuberculous process. It is true that in three out of the six cases the sweats were notably diminished, the cough less severe, and the expectoration more watery; but the results were, after all, not encouraging. No great reaction was observed by the author.

Arsenic.—H. Nicholson, of Colchester, ^{Feb. 11} reports a curious case of intolerance of arsenic. The patient, after taking a very small quantity (15 minims—0.72 gramme—of the liquid arsenic), was seized with a severe attack of diarrhœa and a generalized œdema. He stated that ten years previously he had had a similar attack after simply touching arsenic. All symptoms disappeared after the cessation of the drug.

Asaprol.—Dujardin-Beaumetz and Stackler, of Paris, ^{July 15, 90} have studied a new antithermic and antiseptic agent, to which they have given the name of asaprol. This substance is a derivative of beta-naphthol, but having the advantage of this latter of being extremely soluble. Asaprol is a white powder, highly soluble both in water and in alcohol. The following particulars peculiar to it are worthy of note: (1) its antiseptic equivalent (16 to 17) is about that of salicylate of soda; (2) as an antithermic and analgesic in different diseases it has been shown to be particularly efficacious in acute polyarticular rheumatism, as is the salicylate of soda; (3) it takes effect in the same doses as the salicylate of soda; (4) like this drug, it is rapidly eliminated by the urine, in which its presence is manifested by perchloride of iron (black or bluish discoloration). The tolerance of the organism for this product is remarkable; the remedy has never occasioned vertigo nor singing in the ears. It has been supported without inconvenience in the most varied cases, by dyspeptics and by albuminurics, when the salicylate of soda could not be tolerated.

Aspidospermin.—Bardet ⁹⁹⁶ ⁸⁰ _{Apr. 10; June 15} has made some clinical studies of *quebracho aspidosperma* in the treatment of dyspnœa, and finds that it very distinctly increases the fullness of the movements of respiration, slows the heart, and depresses the temperature. The blood of animals poisoned by it becomes red. Bouchard ⁹⁹⁶ _{Apr. 10} has found the drug very valuable in the treatment of ordinary func-

tional dyspnœa. The dose is from $\frac{1}{4}$ to $\frac{1}{2}$ grain (0.016 to 0.03 gramme), or even as much as 1 grain (0.07 gramme); or a solution may be given hypodermatically, as follows: Aspidospermin, 3 grains (0.2 gramme); water, 3 drachms (12 grammes). To this solution may be added a small percentage of sulphuric acid to maintain its solubility, and the acid may be neutralized at the moment of injection with a little bicarbonate of sodium. Fifteen drops of this solution is the ordinary dose for hypodermatic use.

Benzo-naphthol, Beta-naphthol.—Brück,¹¹⁶_{Feb.} in thirty-eight cases of acute and subacute affection of the gastric and gastro-intestinal tract, made use of benzo-naphthol, mixed in equal parts with sugar, in wafers. The dose was five wafers daily, each containing from 0.04 to 0.15 gramme ($\frac{2}{3}$ to $2\frac{1}{4}$ grains), for children of 1 year; 0.2 gramme (3 grains) for 2 to 3 years; 0.3 gramme ($4\frac{1}{2}$ grains) for from 4 to 7 years; 0.4 gramme (6 grains) from 8 to 14 years. He failed in twelve cases, either because the remedy was not continued a sufficient length of time or because the patients did not receive the proper care. In the other twenty-six cases the antiseptic properties of the drug were clearly manifested by the changing of fetid stools into inodorous ones and the general improvement of the little patients. In an acute case the fever was generally lowered in a very short time. There was temporary amelioration, even in cases of tuberculous origin. There were no secondary symptoms, but diuresis was often increased. Benzo-naphthol shows itself efficacious in intestinal affections, especially those of infectious origin.

Moncorvo⁶⁷³_{Oct., '92} studied the action of beta-naphthol as an intestinal antiseptic in some of the children under his care. He found that it was not always well borne, the patients often complaining of a burning sensation in the stomach or bowels. For the purpose of inhibiting intestinal fermentation, especially in diarrhœas of malarial origin, it proved very favorable, the drug being exceedingly well tolerated. The benzoic acid resulting from the decomposition of the remedy is eliminated by the kidneys in the form of hippuric acid, and consequently acts as a diuretic. The dose given varied from 0.25 to 1.50 grammes (4 to $23\frac{1}{4}$ grains), according to the age of the child and the gravity of the case. In adults Moncorvo has used benzo-naphthol for a long time in cases of yellow fever, with the best results. It was also found advantageous, in

several rebellious cases of malarial diarrhœa, in combination with an equal quantity of bismuth salicylate.

F. Kuhn⁶⁹_{No.9} has failed to observe any disinfectant action of the drug in intestinal putrefaction or fermentation, either in his experimental or clinical experiences. He therefore regards it as inefficacious as an antiseptic in intestinal troubles.

Benzosol.—This substance belongs to the salol group, and passes unchanged through the stomach, but in the intestine is separated into benzoic acid and guaiacol. Piatkowski, of Vienna,⁸_{p.780, '92} who has tried it in eight cases of diabetes, considers it one of the best remedies in this affection. Its distinguishing characteristic is that it acts equally as well in inveterate cases as in recent ones. From its want of taste or odor, and the fact that it does not irritate the stomach, it is suitable for prolonged administration. Under its influence the sugar disappears rapidly from the urine or considerably diminishes, the general condition is improved, strength returns, and grave cases, if not cured, are transferred into benign ones. Even in cases in which antidiabetic diet is ineffectual in causing the glycosuria to disappear, the benzosol is of value, being most efficacious when combined with such a diet. The only accident observed in its use was diarrhœa after the administration of daily doses of 4 or 5 grammes (1 to 1½ drachms). Further experiments are necessary to determine whether the effects of benzosol are permanent or only temporary, and, in the latter case, how long these effects will last; whether it acts upon the pancreas, the liver, or directly upon the blood; or whether, like guaiacol, it influences the nervous centres.

Bichromate of Potassium.—See Potassium.

Bismuth Naphthol-hydrate.—Chapin¹_{July} believes that bismuth naphthol-hydrate may prove to be a very valuable and non-toxic intestinal antiseptic. It is a much finer powder than ordinary bismuth, contains 50 per cent. of oxide of bismuth, is fairly soluble in hot water, and more potent than beta-naphthol in arresting fermentation. Ten grains (0.65 gramme) added to 8 ounces (248 grammes) of putrefying urine were sufficient to arrest the process, and the same quantity added to 16 ounces (495 grammes) of starch-paste which was undergoing acid fermentation at once arrested the fermentation. Chapin gave it to a few children in doses of from 2 to 5 grains in powders or suspended in mucilage.

Bismuth tribromphenol is a new antiseptic, recommended as well-nigh a specific against cholera. It is described as a yellow, neutral, insoluble powder, destitute of odor and taste, nearly non-poisonous, indifferent to mucous membranes and the organs of digestion. It contains 49.5 per cent. of bismuth oxide, besides 50 per cent. of tribromphenol. The daily dose for adults is 5 to 7 grammes ($1\frac{1}{4}$ to $1\frac{3}{4}$ drachms); single dose, 0.5 gramme ($7\frac{1}{2}$ grains). The substance, according to Hueppe, ⁵⁶⁰ _{No.18} ⁸¹⁴ _{Aug.} possesses powerful bactericidal properties—uniting, in all probability, the cholera poison with the bismuth, and transforming it into a non-poisonous and inabsorbable substance, and protecting the denuded intestinal mucous membrane against the development of the cholera bacilli.

Bismuth beta-naphthol contains 80 per cent. of oxide of bismuth, and appears in the form of a brown, neutral powder, inodorous, non-caustic, insoluble in water. Hueppe ⁵⁶⁰ _{No.18} regards it as second only to tribromphenol-bismuth. Nencki ⁵⁸⁶ _{No.1} and Schubenko and Blackstein ⁵⁸⁶ _{No.51, '92} recommend it warmly in diarrhœa, whether of choleraic or other form. The dose is 1 to 2 grammes ($15\frac{1}{2}$ to 31 grains) daily.

Bismuth Phenates.—Jasenski ¹¹⁰¹ _{T.2, No.2} ² _{Sept.9} finds that phenol-bismuth, cresol-bismuth, and β -naphthol bismuth, when introduced into the stomach, become decomposed into their components under the influence of the gastric juice. A portion, however, escapes decomposition and passes on into the intestine, where it is finally split up. The phenol and cresol, separated from the bismuth, are entirely absorbed, eliminated in the urine as sulpho-conjugate acids, or combined with glycuronic acid; the β -naphthol is only partly eliminated in this manner, the remainder passing unchanged through the whole length of the digestive tract, and being expelled with the fæces. In the urine of man the bismuth is not discoverable, being entirely eliminated in the fæces. Notwithstanding the toxic properties of the phenols, none of these preparations have any toxic action, even if given in daily doses of 5 grammes ($1\frac{1}{4}$ drachms). This is probably due to the extreme slowness of the decomposition which goes on in the intestine. The author therefore recommends these preparations in all cases where the ordinary preparations of bismuth and phenols were formerly employed.

Boric Acid.—I. Tortschinsky ⁸⁵⁹ _{No.48, '92} has used boric acid in two

hundred and forty cases of typhoid fever, with excellent results. Nine patients died during convalescence, from errors of diet or from getting up too soon. All the others recovered rapidly. Treatment was begun by giving from 8 to 15 grammes (2 to 4 drachms) of castor-oil with 5 to 20 drops of essence of turpentine. After these had produced the desired effect, boric acid was administered in powder or solution, from 0.20 to 0.30 gramme ($3\frac{1}{10}$ to $4\frac{3}{5}$ grains) for children, and from 0.90 to 1.25 grammes ($13\frac{3}{4}$ to $19\frac{3}{10}$ grains) for adults, three times a day. If bronchitis were present, expectorants and hydrochloric acid were combined with the boric acid. As a general rule, the fever and diarrhœa diminished notably in from three to five days, the tympanites disappeared, the stools became normal, the urine normal and abundant, the skin and tongue moist, and the general condition much improved. The fever ran a benign course, its duration being shortened and complications being rare, especially if the boric acid were employed from the beginning.

Bromoform.—Burton-Fanning^{15 Feb.} has studied the action of bromoform in the treatment of whooping-cough. Of thirty children, varying in age from 3 months to 8 years, the author has only lost one, whose condition was already very desperate before the beginning of the treatment, owing to a complication of capillary bronchitis. In the other cases the results were very satisfactory. The author administered the bromoform in the form of an emulsion, mixed with gum-tragacanth, syrup, and water.

In a later communication,^{2 Jan. 7, '94} he warns against the danger of poisoning by the last dose in the bottle containing this mixture, and advises either that this dose be not used, or that the drug be supplied in a pure form, and that the nurse be instructed to measure the dose with care. He has observed untoward effects in his own practice from the use of the last dose.

Bromo-gallol.—Lépine and Cazeneuve, of Lyon,^{211 July 9} have made researches concerning bromo-gallol, or bromo-gallic acid. It is a substance resembling bromic acid, in which two atoms of bromine replace two atoms of hydrogen. In therapeutics it is a succedaneum of bromide of potassium. The characteristic of its action is the fact that we have to deal with an organic composition, and that the bromine which is disengaged returns to its nascent state. As a sedative it has given excellent results in a case of chronic chorea.

In epilepsy it is less powerful than the bromide of potassium ; this may result from the fact that it must be administered in smaller doses, because toxic effects are to be feared. A dog, weighing from 15 to 18 kilogrammes (8 to 9½ pounds), was killed by an injection, into the stomach, of 10 grammes (2½ drachms) of bromo-gallol. Intra-venous injections of the same dose induced death in ten minutes. The blood of the animal thus sacrificed is of the color of saffron, and contains an enormous quantity of methæmoglobin. The cardiac phenomena are *nil* ; respiration is at first much accelerated, then becomes slower, diminishing to 12 per minute, with a prolonged expiration ; at the moment of death it again becomes accelerated. The end comes very suddenly, and is probably due to the alteration of the blood.

Caffeine.—J. D. Proserowsky⁵⁸⁶_{No. 18} has studied the influence of coffee and some of its substitutes upon pathogenic micro-organisms. He used in his researches the coffee of Ceylon and two substitutes, rye and acorn coffee. He roasted the Ceylon coffee himself, but bought the others already prepared. Having sterilized bouillon and simple infusion of coffee (infusion of coffee and peptonized meat-bouillon), he made pure cultures of the bacilli of typhoid fever, cholera, and anthrax. In all his experiments the author used only 10-per-cent. infusions ; that is to say, the same strength as that of the coffee ordinarily used as a beverage. His conclusions are as follow : 1. Coffee possesses incontestable, though weak, antiseptic properties ; in this respect it is superior to both its substitutes, rye and acorn coffee, the acorn being the more active of the two latter. 2. The antiseptic action is due to empyreumatic substances formed during roasting, and also partly to caffeo-tannic acid, the presence of which is alone capable of explaining the antiseptic action sometimes shown by infusions of raw ground coffee. 3. The antiseptic action of the substitutes is attributable partly to empyreumatic substances, and probably partly to their acid reaction. 4. The antiseptic action of coffee and its substitutes is more active when the infusion is made with water than when made with liquids (as bouillon) more favorable to the development of bacteria. 5. The ordinary infusion is strong enough to kill the microbe of cholera and anthrax in three hours, of typhoid fever in one day, and the spores of anthrax in nine days. While equally strong infusions of the substitutes exert the

same action on the bacilli of typhoid fever, cholera, and anthrax, they exert almost no influence on the spores of the anthrax bacillus.

Czarkowski⁵⁸⁶_{No.4} calls attention to the contra-indications of caffeine in alcoholism. He reports three cases in which its use was followed by intense excitement. In these cases the doses should be small at first and gradually increased; and the attendants should be warned to suspend the use of the drug at once on the appearance of any symptoms of excitement.

Calomel.—See Mercury.

Carbolic Acid.—H. Tomkins¹_{Mar.4} has employed carbolic acid in epidemic diarrhœa with fetid stools, as well as in flatulent fetid dyspepsia, obtaining good results by its internal administration in doses of 1 drop in 30 grammes (1 ounce) of water for children, and 2 to 4 drops in 8 grammes (2 drachms) of water for grown persons. No bad effects were observed from its use. Sloan¹_{Mar.26} treated ten cases of typhoid fever with carbolic acid. According to him, it is not only capable of cutting short the fever in its evolution, but, even in cases of epidemics, of preserving from the disease as vaccine preserves against small-pox. The author gives 0.15 gramme ($2\frac{1}{8}$ grains) three times a day, in the form of pills, the fever disappearing after three days of such treatment. The pills are continued, however, one in the morning and one in the evening; and if the temperature remain normal, one pill a day for two days longer. In four out of ten cases diarrhœa occurred after the suppression of the drug; so that it was necessary again to administer it. In all ten cases the fever was arrested and no complication occurred. Convalescence went on rapidly and without much emaciation.

A. Wigglesworth²_{Feb.18} has found carbolic acid of service in various microbial affections. He recommends the following doses: 0.06 gramme ($\frac{9}{160}$ grain) up to 1 year of age; 0.09 to 0.12 gramme ($1\frac{2}{5}$ to $1\frac{4}{5}$ grains) from 1 to 10 years; from 0.18 to 0.30 gramme ($2\frac{4}{5}$ to $4\frac{2}{5}$ grains) for adults. These doses are to be repeated every two hours day and night as long as the urine does not become dark. He never observed vomiting in his patients. He prescribes the following mixture: Carbolic acid, q. s., according to age; chloroform, several drops; simple syrup, q. s.; distilled water, q. s. to make 240 grammes (8 ounces); tincture of cardamon and bitter

orange-peel, q. s. to flavor. To be taken every two hours in tablespoonful doses, followed by several mouthfuls of water. This mixture has an agreeable taste, and is readily taken even by children. It is of service in all stages of puerperal fever. The author is assured of the prophylactic value of carbolic acid in scarlet fever; for the last twelve years he has been in the habit of prescribing it in doses of 0.12 gramme ($1\frac{4}{5}$ grains) twice a day to all the inhabitants of a house in which there is a case of scarlatina, and has never seen infection follow in any instance.

In three cases of chronic inflammation of the rectum, from different causes, M. A. Strizover ⁵³⁰_{V.30, No.9} has obtained a cure by means of enemata of carbolic acid in solution, twice daily for a more or less prolonged period. Ten drops of the acid are dissolved in two glassfuls of water, as hot as possible, and the injections retained from six to ten minutes.

Hayem ⁶⁹¹_{Nov.30,'92} ²⁶_{Feb.} proposes the use of carbolic acid as a vesicant under the following form: Crystallized carbolic acid, 9 parts; alcohol at 90°, 1 part. Olivier adopts the following method in using this preparation: 1. In order to avoid diffusion thereof beyond the zone in which the effect is desired, the part is isolated by a bordering of vaselin. 2. The greasy matter possibly present on the surface to be treated is removed by some lint steeped in concentrated alcohol or in ether. 3. The spot being quite cleansed, the solution is applied by lint steeped therein and fixed to a wooden handle. 4. After waiting for about a minute, during which the skin becomes white, the excess of acid is removed by a pencil moistened with alcohol. 5. The place should be simply dressed with lint secured by a bandage. The pain is not greater than that produced by tincture of iodine, and rapidly disappears. A brownish stain is left, which, however, eventually vanishes.

Cascarine.—Leprince ⁶⁷_{Mar.8} appears to have isolated the active principle of *Rhamnus Purshiana*, commonly known as cascara sagrada. This substance, which he designates cascarine, occurs in prismatic crystals of an orange-yellow color, forming a deep reddish-purple liquid when dissolved in an alkaline solution. It is insoluble in distilled water, but soluble in alcohol and ether. Cascarine appears to have a slight action as a cholagogue. It produces an easy action of the bowels without the griping which frequently accompanies the action of cascara sagrada. Even in large

doses it does not appear to give rise to any nausea, serous diarrhœa, or colic; nor does it leave subsequent constipation. The dose is from 0.10 to 1.00 gramme ($1\frac{1}{2}$ to $15\frac{1}{2}$ grains).

Chloralose.—Richet and Hanriot, of Paris, ⁶_{Jan.21} have given this name to a new hypnotic, a combination of chloral with glucose (anhydro-gluco-chloral), having antagonistic properties, since it has, at the same time, an excitant action upon the spinal cord. In doses of 0.30 gramme ($4\frac{1}{2}$ grains) its hypnotic effects begin to be felt, and as much as 0.80 gramme ($12\frac{1}{2}$ grains) may be given without causing digestive disturbance, headache, or other inconveniences. It is very bitter in solution, and is best administered in wafers. It is especially efficacious in obstinate insomnia. Féré, of Paris, ⁹²⁷_{Feb.28} administered chloralose with good results in hysteria and epilepsy. Failure in its use was due to insufficient doses; indeed, the doses indicated by Richet (1.50 grammes—23 grains—maximum) are often too small, and cause excitement without producing sleep. 1.75 grammes (27 grains) and even 2 grammes (31 grains) may be given without any inconvenience. Féré administered 2.25 grammes (35 grains) to one hysterical patient and observed some symptoms of poisoning; the sleep was profound and the breathing stertorous, but on awaking the patient was perfectly well. He urinated involuntarily during the sleep,—a symptom which he had never before exhibited. In a case of chorea the author tried doses of 0.75 gramme (12 grains). The movements disappeared and the drug produced no gastric trouble, although its use was continued for several weeks.

Chouppe, of Paris, during eight consecutive days, administered chloralose to a neurasthenic patient who had insomnia and dyspeptic phenomena. Under its influence the insomnia ceased and at the same time the gastric troubles improved. One need not be afraid, therefore, of employing chloralose in dyspeptic cases of nervous origin, for by diminishing the nervous excitement the condition of the digestive functions are improved.

J Lacaze, ³_{Mar.25} confirms the assertions of Richet, that calm sleep is obtained by a dose of 0.20 to 0.40 gramme (3 to 6 grains). In one case of tetanus chloralose diminished the contractures, suppressed the cramps, and caused calmness without preventing the progress of the disease. In a case of paramyoclonus sleep was secured with diminution of the spasmodic movements.

Antipyrin, bromides, and chloral had failed. Goldenberg²⁰¹² states that chloralose acts especially on the brain and spine, this action being manifested in doses as small as 0.15 gramme (2 grains), although 2.50 grammes (38 grains) may be safely taken in one day. It is a convenient and reliable hypnotic; the awakening is easy; there is no vomiting or nausea; no headache, lowering of arterial pressure, accumulation, or tolerance. It is indicated in gastric or intestinal affections on account of the absence of digestive symptoms after its use; and in cardiac affections on account of its stimulating action upon the heart through the medium of the medulla. Hysterical patients, however, are very susceptible to the drug, and it must be given to them with caution. Lombroso and Marro^{505 June 10} gave chloralose fifteen times to three insane patients, in doses of 0.25 to 0.50 gramme (4 to 7½ grains). In the beginning sleep always followed a dose of 0.25 gramme (4 grains), but later the amount had to be gradually increased to produce the same effect. Insomnia re-appeared on the cessation of the drug. In one case the temperature was observed to be above the normal; in the rest it fell but 0.2° to 0.9° C. (0.36° to 1.62° F.). In one case there was a diminution of urea in the urine, relative as well as absolute; in the other cases the urea was increased. The chlorides were always increased. The authors consider chloralose as one of the least harmful of ordinary hypnotics, rarely producing general symptoms. In one case, carefully observed by Lombroso, trembling and amnesia followed the use of 0.15 to 0.25 gramme (2¼ to 4 grains). D'Amore^{505 June 1} used the drug in a large number of cases of various diseases in which insomnia was an obstinate symptom, in all cases succeeding completely in producing tranquil sleep without any unpleasant secondary phenomena. He regards it as possessing notable hypnotic qualities, stimulating the spinal cord, but not affecting the circulation or respiration.

A. Heffter^{4 No. 20} claims the priority in the discovery of chloralose. According to him, chloralose and parachloralose are the two chloral glucoses,—one soluble and toxic, the other insoluble and inactive, described by him in 1889. Chloral glucose acts as an hypnotic in the rabbit, and causes convulsive movements and paralysis of the extremities in the dog. In the rabbit the ataxic movements are less pronounced and death follows paralysis of the respiratory centre, the heart continuing to beat and the blood-pressure remain-

ing the same until respiration is arrested. If artificial respiration is effected, the pressure rises for a very short time. This action of chloral glucose differentiates it clearly from chloral hydrate, which, as is known, causes continual lowering of blood-pressure following paralysis of the vasomotor centre and slowing of the heart-beats.

Chloride of Methyl.—Hertmann¹¹⁶_{Apr.} reports the results obtained by him during one year with pulverizations of chloride of methyl, as applied to seventy cases of various painful affections, such as neuralgia, rheumatic pains, etc. Taking into consideration the cases noted, the author strongly recommends the drug, the more so as, with a little attention and experience, all untoward secondary effects, as erysipelas, lymphangitis, gangrene, etc., mentioned by others, may be obviated. As for the bullæ formed on the track of the pulverizations, it suffices to previously rub the skin with glycerin or vaselin, in order to prevent their occurrence.

Chloryle.—This is a new anæsthetic obtained by mixing chloride of ethyl with chloride of methyl.¹⁰⁴⁹_{No.12} It remains liquid at zero, while chloride of methyl boils at 27° C. (80½° F.); its evaporation causes less energetic freezing of the skin than chloride of methyl. Chloryle is indicated in dental surgery and for anæsthesia in small operations.

Cocaine.—Kuborne⁵⁷⁵_{v.33,'92} points out a normal reaction by which cocaine may be recognized. A small quantity is placed in a little porcelain tube, with several drops of nitric acid. It is evaporated to dryness in a water-bath; after cooling, a drop of caustic potash in ethylic alcohol, or, better, amylic alcohol, is added, and heated in a water-bath, when a violet color is seen. The same reaction is observed with atropine, but with this alkaloid it is produced cold, while with cocaine it is necessary to heat the solution.

Haecker⁸_{No.10} recommends the following solution for use as an anæsthetic in minor operations: *Hydrochlorate* of cocaine, 1 gramme (15½ grains); chloride of sodium, 2 grammes (31 grains); distilled water, 100 grammes (3¼ ounces). The secondary phenomena observed after cocaine are said to be avoided by the employment of this mixture.

Phenate of cocaine is a substance resembling honey, containing 75 per cent. of cocaine, easily soluble in alcohol at 50 per cent. There is a slight odor of carbolic acid in the solution. C. A. Veasy⁹_{Apr.} has used the drug on account of its combining the

properties of carbolic acid and cocaine. Anæsthesia was produced in eight minutes at the latest, when used in the nose, larynx, trachea, urethra, and ear. In the eye a 4-per-cent. solution produced at first a smarting sensation, but rapid anæsthesia followed. The use of phenate of cocaine is not followed by harmful secondary effects, such as are observed after hydrochlorate of cocaine, but in order to obtain the same anæsthesia recourse must be had to a more-concentrated solution. Analgesia occurs somewhat less rapidly than with cocaine, but it lasts longer. This fact, together with its antiseptic power, render it superior to hydrochlorate of cocaine, which is decomposed by microbes.

It is claimed ²⁹⁰_{Aug.1} that cocaine, when applied in solution or as an ointment to the breasts of nursing women, causes temporary suppression of the lacteal secretion, as well as prevents the erection of the nipple. It is therefore not desirable for use in fissures of the breast.

Codliver-Oil.—Bonillot, of Paris, ⁹²⁰_{Feb.27} states that the organic principles from which codliver-oil receives its most important properties are all of biliary origin. He has combined these alkaloids under the term pangadiune. This product, under the microscope, is a crystallized body, soluble in alcohol at 80 per cent., in glycerin, water, etc., and gives a fixed residue of 3.50 grammes ($53\frac{3}{4}$ grains) per 100. It is indicated in all affections due to slow nutrition, gout, rheumatism, diabetes, pathological conditions in which chemical examination of the urine shows incomplete organic oxidation; in neurasthenic weakness, and in the weakness of professional fatigue; in all cases, indeed, where there is an increased production or elimination of toxins. Finally, in tuberculosis it acts as a stimulant of nutrition and increases bodily resistance.

Codeine.—An anonymous writer, ¹_{No.1} a morphinomaniac, has tried upon himself and others the action of codeine against the symptoms due to abstinence from morphine. His results were excellent, and he warmly recommends the drug in such cases. No untoward symptoms were observed after 0.60 to 0.72 gramme (9 to 11 grains) of sulphate of codeine. Tolerance is not established.

Copaiba Balsam as a Diuretic.—S. Bronowski ⁵²⁰_{No.29} used this remedy in six cases,—three of hepatic cirrhosis, one of cardiac insufficiency complicated with cirrhosis, one of hepatic cancer, and one of pleural effusion and apical tuberculosis. He found

the best form of administration to be by an emulsion of 8 grammes (2 drachms) of copaiba to 180. The patient bore 6 grammes ($1\frac{1}{2}$ drachms) daily without bad effects. Tincture of peppermint was used to disguise the disagreeable taste. He found it to be entirely satisfactory as a diuretic.

Cornutin.—Bokai, of Budapest, ³⁹²_{No.3} recommends citrate of cornutin in the treatment of spermatorrhœa. Daily doses of 0.003 to 0.006 gramme ($\frac{1}{20}$ to $\frac{1}{10}$ grain) were given, the remedy being always well borne, even when its use was continued for several months. In most cases the spermatorrhœa diminished from the second or third day, and entirely disappeared in ten days. It is especially valuable in the paralytic form of the disease, but fails, on the other hand, in the spasmodic form, such as that which succeeds inflammation of the seminal vesicles or vas deferens.

Corrosive Sublimate.—See Mercury.

Creasote.—Henry S. Stark ⁸⁰_{Dec.15,'92} believes that the reputation of creasote as an antituberculous remedy is firmly established; that it is of especial service in the initial stage of phthisis; that it may be prescribed in rather large doses for a prolonged period; that it is a prophylactic in pretubercular anæmia; that the best manner of administering it is by combining it with appropriate medicaments, as iron, codliver-oil, etc. Th. Weyl and A. Albu, ⁴_{No.51,'92} basing themselves upon numerous clinical and experimental observations, state that, while creasote is of great service as a symptomatic remedy (expectorant, stomachic, and tonic), it has scarcely any influence upon the progress of fever or phthisis. It is true that during its administration an increase of weight and an improvement in the general health may be observed; but is it certain that this improvement is due to the drug, or to the improved hygienic condition and alimentation of the patients at the hospital, and to the care with which they are there surrounded? This is the more an uncertain question since the progress of phthisis is very capricious, and the periods of improvement and aggravation depend much upon the individuality of the patient. As to the so-called specific action of creasote the authors are assured, by direct experiments, that the drug does not diminish the number of Koch's bacilli, nor attenuate their virulence. It is to be seen therefore that, clinically as well as bacteriologically, creasote is denied by these authors any specific action in phthisis.

Faüel¹¹⁶_{Mar.} recommends the following method of Jerouis for small creasote pills: White gelatin, 11 parts; sugar, 5 parts; dissolved in water, 24 parts. One part of this, heated, is made into an emulsion with creasote, and by the addition of licorice-powder a pill is made very rich in creasote.

Léger,⁷⁴⁷_{July 16} in order to avoid the disadvantages presented by the different forms of administering creasote, proposes to give the remedy to the patient in the form of an emulsion prepared with saccharate of casein. The emulsion may be instantaneously prepared in the following manner: Place in a bottle, creasote, 10 grammes ($2\frac{1}{2}$ drachms); alcohol, 10 grammes ($2\frac{1}{2}$ drachms); and add the following solution, which should be prepared separately: Saccharate of casein, 10 grammes ($2\frac{1}{2}$ drachms); water, 10 grammes ($2\frac{1}{2}$ drachms). After shaking for several seconds the emulsion is ready. A sufficient quantity of water to make 1 litre (quart) is added. This 1-to-100 emulsion may be internally administered in teaspoonful doses, mixed with milk, or it may be given in rectal injections of from 100 to 125 grammes ($3\frac{1}{2}$ to 4 ounces).

Cresalol.—R. Neisse⁹⁵³_{No. 8} sums up as follows the therapeutic uses of cresalol: 1. As substitutes for salicylate of soda in the treatment of rheumatism and of pleurisy with serous effusion, ortho- and para-cresalol are not inferior to salol. 2. They can also be usefully employed as antiseptics in the intestinal and urinary passages. Given in typhoid fever at the beginning of the disease and continued until the fall of the temperature, they favorably influence the progress of that affection. While in affections of the urinary passages its success depends entirely on the nature of the lesion, cresalol should, like salol, be tried in the initial stages of cholera. 3. The best way to administer cresalol is in doses of 1 gramme ($15\frac{1}{2}$ grains), or of 2 grammes (31 grains) if a more-marked reduction of the temperature is desired; 6 to 8 grammes ($1\frac{1}{2}$ to 2 drachms) may be administered per day, and, in case of necessity, as much as 10 grammes ($2\frac{1}{2}$ drachms), without fear. 4. The accidents caused by the drug are only temporary, and occur not oftener than with salol.

Cresol Saponate.—Burekhardt³¹⁷_{Jan. 27} has used this substance as a substitute for lysol in gynæcology, finding the latter drug to have some inconveniences, among them that of being patented and of not being uniform in composition. Saponate of cresol, called

“sapocarbol” by Hager, is prepared in the following manner: Pure potassium soap (German Pharmacopœia) is melted in a water-bath and an equal quantity of carbolic acid (100 per cent.) added. The solution thus formed is heated until a specimen taken is found to remain limpid even when cold, and to dissolve in distilled water. After removing the muco-tarry substance adhering firmly in small quantities to the vessel, a limpid liquid is obtained, neutral in reaction, of the color of Madeira, and of a specific gravity of 1.06. This liquid dissolves in all proportions in water, alcohol, and glycerin. The slight cloudiness with chloroform and alcohol is removed by boiling. Saponate of cresol is superior to lysol in that its color is not so pronounced and its odor not so disagreeable. Engler has called attention to the dangers of alkaline lysol. There is no danger of saponate of cresol thus prepared. Indeed, the potassium salt containing 0.25 per cent. of caustic potash, it is evident that a 0.5-per-cent. solution of saponate of cresol contains but 0.000625 per cent. of caustic potash,—an almost inappreciable quantity.

Cytisine.—Aubert, of Lyons, ²¹¹_{May 29} discusses the sudoriparous properties of cytisine, a substance which, in this respect, may be classed with lobeline. Arloing also regards it as having very strong general sudoriparous effects. Aubert considers it as possessing considerable toxicity, in common with all the plants of the *cytiscus* family. The reason that animals who browse upon the *cytiscus* are not fatally poisoned is because severe vomiting is provoked by the poison.

Dermatol.—Martin, ²_{Dec. 24, '92} in a case of diarrhœa in a patient far advanced in phthisis, in which all other remedies had failed, was able to control the diarrhœa by means of dermatol administered four times daily in doses of 2 grammes (31 grains).

Matheus ¹¹⁶_{Aug.; Sept. 9} has used dermatol with great success in the treatment of ulcers, etc., but in its application to these troublesome affections in the lower extremities its use was often accompanied by the appearance of a localized dermatitis, affecting the skin for some distance around the ulcer, causing much redness and troublesome serous exudation. This took place after an external use of dermatol, and during perfect rest after about a week's treatment, the affection lasting ten to fourteen days, and in one case giving rise to much pain and urticaria. The author gives the histories

of three patients where this complication occurred, but the ultimate recovery of the ulcers was by no means impeded, as healing took place in from three to five weeks.

G. Wicke ⁵⁷_{Jan. 29} finds that if the granulations following the cauterization of nitrate of silver be immediately powdered with dermatol, the pain resulting from the cauterization will rapidly disappear.

Diaphtherin.—Lembach and Schleicher ²¹⁴_{Nov. 1, '92}; ¹¹²_{Feb.} report the discovery of this new antiseptic. As a germicide it is much better than phenol and lysol in the form of a 2- or 3-per-cent. solution. Instruments that are not nicked are blackened by its use. It has an advantage over carbolic acid in that it is easily transported, either in the form of powder or tablets, its peculiar yellow color preventing it being mistaken for any other preparation. It is chemically clean and its action easily controlled. It is not poisonous. A watery solution is perfectly clear, and there is no evaporation. Kronacher recommends its use in surgery in strengths of $\frac{1}{2}$ - to 2-per-cent. solutions. It is a most excellent dressing in cases of burns. There is never any irritation about the edges of wounds after its use, but occasionally patients complain of a slight burning sensation. The solutions do not affect the hands of the operator as do sublimate and carbolic solutions. Its greatest application is to be found in the treatment of nasal and aural troubles.

Digitalis.—Mullier, of Paris, ²⁴_{May 14} discusses the choice of preparations of this drug and the mode of administration. He gives preference to digitaline, but states that it is necessary to use a good preparation. There are two sorts of digitaline in the trade, crystallized and amorphous, their value being unequal; again, the action of light causes certain kinds of crystallized digitaline to become amorphous. The French Pharmacopœia recognizes but one sort of digitaline, namely, that which readily and completely dissolves in alcohol and not at all in water. Consequently, when digitaline is found to be soluble in water, it should be rejected. The chloroform digitaline is used in doses of 0.00025 to 0.001 gramme ($\frac{1}{260}$ to $\frac{1}{64}$ grain) in granules containing 0.0007 gramme ($\frac{1}{2}$ grain), or else in solution of 1 to 1000.

Jules Pechl ²⁰¹⁶_{July}; ²¹²_{July} fixes the length of time for the administration of digitalis as follows: In doses of 0.10 to 0.30 gramme ($1\frac{3}{4}$ to $4\frac{1}{2}$ grains), not longer than one month; in doses of 0.30 to 0.60

gramme ($4\frac{1}{2}$ to 9 grains), fifteen days, the best results being obtained in from five to eight days; in doses of 0.80 gramme ($12\frac{1}{2}$ grains), not longer than four days; and in doses of 1 gramme ($15\frac{1}{2}$ grains), two days. These doses refer to the infusion of digitalis, which the author finds to be more regular in its action and better tolerated than digitaline. F. M. Brooks, of Virginia, ¹_{Oct. 29, '92} reported a case, remarkable for the long-continued use of the drug and the size of the dose, 35 drops, three times daily, having been taken from November, 1888, to September, 1892. Cardiac affections produce a constant catarrhal condition of the mucous membranes lining the alimentary tract; so that drugs given by the mouth are never properly absorbed by the system. Zieniec, at the instigation of Stolinkoff, of Warsaw, ²⁶_{Apr. 1} conceived the idea of subcutaneously administering the infusion of digitalis. He experimented thus in cases of mitral regurgitation, obstruction complicated with regurgitation, and in aortic stenosis and regurgitation. The experiments demonstrate that, when no or only slight results have accrued from its administration by the mouth, even small subcutaneous injections have been of great benefit. Each injection of from 1 to 2 grammes (15 to 30 minims) contained the active parts of from 0.015 to 0.03 gramme ($\frac{1}{4}$ to $\frac{1}{2}$ grain) of the powdered leaf. The process to be repeated not more than three times in twenty-four hours.

Dithiocarbonate of Potassium.—See Potassium.

Diuretin.—W. Cohnstein ⁴_{No. 4} has made some researches upon the action of this drug, introducing into the stomach of dogs and cats diuretin dissolved in water. The results obtained were as follow: Diuretin does not raise the blood-pressure nor influence, in any constant manner, the pulse. It does not modify the cardiac contractions. In large doses it gradually lowers the blood-pressure and diminishes the number of pulse-beats,—facts which must be elucidated by further experiments. Diuretin, in physiological doses, not exercising any influence upon the heart and vessels in mammals, it is to be supposed that the diuresis following its administration is due to its direct action upon the kidneys.

B. Herrick ⁶¹_{Mar. 11} reports four cases of ascites,—three of cardiac and one of hepatic origin,—in which he tried diuretin. In the case of hepatic cirrhosis the result was not satisfactory; the diuretin, while augmenting diuresis, did not diminish the ascites.

In the cases of valvular disease, however, the drug was active, rapidly increasing diuresis, strengthening the heart's action, slowing and regulating its beats, diminishing the ascites, improving the appetite, and causing the disappearance of dyspnœa and cyanosis. The author cites 4 cases treated by A. E. Halstead, 1 of mitral insufficiency and parenchymatous nephritis, 1 of insufficiency and mitral stricture with chronic nephritis, 1 of mitral insufficiency consecutive to a renal lesion, and 1 case of chronic nephritis with marked uræmic prodromata. In 3 of these the results were good, but in the case of secondary mitral insufficiency there seemed to be an increase in the blood-pressure and an exacerbation of all the morbid symptoms—dyspnœa, headache, vertigo. Herrick reached the following conclusions: 1. Diuretin acts directly upon the renal epithelium and is indicated in all cases in which there is generalized œdema. 2. In cases in which digitalis and the heart-tonic fail, diuretin is the best remedy for ascites of cardiac origin. 3. It may be advantageously associated with digitalis and pure cardiac tonics. 4. It seems probable that the drug acts as well upon the heart as upon the kidney, slackening and strengthening the heart-beats and regulating the rhythm. 5. Diuretin sometimes exerts an influence upon other diseases of the circulatory apparatus accompanied by ascites, such as myocarditis, pericarditis, aneurism, and arterio-sclerosis, though here its action is more uncertain than in valvular lesions. 6. In ascites of renal origin it may be employed without fear of irritating the renal epithelium. If the latter be degenerated, failure may be expected. 7. It fails ordinarily in ascites of portal origin, and especially when due to hepatic cirrhosis. 8. As secondary effects, nausea, vomiting, diarrhœa, palpitations, headaches, and slight elevation of temperature are occasionally observed. Cutaneous eruptions are rare. 9. The maximum daily dose is 9 grammes ($2\frac{1}{4}$ drachms), the average daily dose from 3 to 7 grammes ($\frac{3}{4}$ to $1\frac{3}{4}$ drachms) administered in portions. In cardiac affections where diuretin is combined with tonics smaller doses will be sufficient. 10. It may be prescribed in solution in water or milk, in pills or capsules, preferably between meals. Acids are incompatible with diuretin.

Pawinski⁵⁸⁶_{No. 18} studied, in more than fifty cases, the action of diuretin upon the quantity of urine, the pulse, and the blood-pressure. His conclusions are as follow: 1. Diuretin is in no

way a regulator of the nerves of the heart as is digitalis. If it regulate the pulse and slow the heart-beats, it is by favoring diuresis, diminishing the œdema, and thus removing the obstacles to be overcome by the heart. 2. It increases blood-pressure by excitation of the vasomotor centres. 3. It has considerable diuretic power, which must be attributed to the circulation, and not to its action on the renal epithelium. 4. It often causes nervous symptoms, such as headache, buzzing in the ears, somnolence, or insomnia. 5. It acts more efficaciously in diseases of the myocardium than in valvular affections or orificial lesions. Good effects may be expected when the œdema depends upon weakening of the heart-force. It is of use in the cardiac troubles of interstitial nephritis, but fails in ascites dependent on cirrhosis of the liver. 6. The author prescribes doses of 3, 4, and 5 grammes ($1\frac{1}{4}$ drachms) daily. If diuresis is not increased in six days the use of the drug should be suspended, and recourse had to other treatment. It is preferable to give diuretin in solution.

R. del Valle y Aldabalde ⁶³²_{Nov. 7, '92} used diuretin in cases of ascites due to hepatic cirrhosis, without favorable results. Daily doses of 5 to 7 grammes ($1\frac{1}{4}$ to $1\frac{3}{4}$ drachms) were given in twenty-four hours, and seemed to cause diarrhœa and loss of appetite. In ascites of renal origin a certain amount of diuresis was caused, but the effects were not marked. In cardiac dropsy, on the other hand, the results were excellent, especially in cases of valvular trouble, often proving beneficial when other remedies had failed.

Duboisine.—Mendel ⁷⁵_{No. 3} found duboisine to possess an hypnotic and soothing effect upon patients affected with great motor excitement. He administered by subcutaneous injections 0.0005 to 0.0008 gramme ($\frac{1}{130}$ to $\frac{1}{80}$ grain). He rarely used 0.001 gramme ($\frac{1}{64}$ grain). As secondary toxic effects the author always observed dilatation of the pupil and consequent visual troubles, dryness of throat, and moderate acceleration of the pulse. He considers vertigo and staggering as due to the action of the drug upon the motor centres. Even in doses of 0.0002 gramme ($\frac{1}{320}$ grain) he observed symptoms of this kind. Mendel also used the drug in twelve cases of paralysis agitans with very good effect, and he considers it one of the best palliatives, especially in grave cases. Belmondo ⁵⁹¹_{v. 18} injected this drug one hundred and sixty-seven times in thirty-two patients, finding it to resemble hyoscine in its calm-

ing action in psychic and motor disturbances. Its hypnotic action was superior to chloral. In acute mania it regulated the psychic symptoms and seemed to exercise a beneficial influence on the progress of the disease. The doses given were from 0.0005 to 0.0015 gramme ($\frac{1}{130}$ to $\frac{1}{40}$ grain); larger doses were not so well borne and provoked vomiting. Mazzocchi and Antonini⁵⁸⁹_{Nov. 15, '92} confirm the favorable opinion as to the action of neutral sulphate of duboisine in the treatment of mental disease. Thirty patients, suffering from various psychic troubles, from light excitement up to furious mania, were submitted to treatment by the drug in doses of from 0.0005 to 0.002 gramme ($\frac{1}{130}$ to $\frac{1}{32}$ grain). In more than two hundred injections, no vomiting, vertigo, or visual troubles, as noted by other writers, were observed. Almost always the injection was followed by mydriasis, weakness, and diminution of the number of heart-beats; and sleep, lasting from four to five hours, often appeared about twenty minutes after the injection. In a certain number of cases, not only did the duboisine exercise an hypnotic action, but the patients remained quiet during the day, their psychical condition being undoubtedly ameliorated. To assure themselves that suggestion played no part in the results obtained, water was injected from time to time instead of duboisine, but without result.

C. Crouzet¹⁷³_{Feb. ; Mar. 6} publishes a case of iritis plastica with adhesion of the whole pupillary margin to the lens, in which he used 5 drops daily of the following solution: Dub. sulph., 5 cubic centimetres ($1\frac{1}{4}$ drachms); aq. dest., 10 grammes ($2\frac{1}{2}$ drachms). Four days later the patient began to complain of dryness of the throat; but the synechiæ beginning to yield, the treatment was persevered with until, a few days later, other general symptoms having appeared, the duboisine had to be discontinued. The symptoms were frequent pulse, great weakness, rise of temperature, and disturbances of speech similar to those present in aphasia. Crouzet has not been able to find, in medical literature, any mention of such disturbances of speech produced by duboisine.

Ethyl Chloride.—This liquid, according to Haecker,⁸_{No. 10} is kept in a glass bottle containing 10 cubic centimetres ($2\frac{1}{2}$ drachms), one extremity of the bottle being a capillary tube. The end of this tube is broken off and the bottle held at a distance of ten, twenty-five, or forty centimetres from the spot to be anæsthetized.

The heat of the hand drives out the liquid, which is deposited in powder on the skin; after one-quarter to one-half a minute the skin becomes white, cold, and insensitive. Half the contents of the bottle cause sufficient anæsthesia for a small incision, and the entire contents for a more extensive one. As the skin hardens under the chloride of ethyl, the exact limits of the incision must be determined beforehand. On the theory that the action of chloride of ethyl is transmitted through the skin to the nerve-endings, the author has made use of it in the extraction of teeth, using the anæsthetic upon the skin of the cheek in the region of the inferior alveolar nerve. He succeeded in obtaining anæsthesia in twenty-four out of twenty-six cases. The method was also of value in two cases of neuralgia. Redard ¹⁴_{Aug. 27} has devised an ingenious application for the use of chloride of ethyl. The liquid is held in a glass tube, at the mouth of which a lighted match is placed. It is of value in the cauterization of septic or aseptic wounds, for cutaneous cauterization, local anæsthesia, or antisepsis.

E. Gans ¹¹⁶_{Mar.} used chloride of ethyl with success as an anæsthetic in a dozen cases,—one of supra-orbital neuralgia, one of neuralgia of the left breast, three of commencing gout, one of scrotal pruritus in a diabetic, and several cases of migraine. In the three cases of gout the drug seemed to cut short the attack: 10 grammes (2½ drachms) were generally sufficient for one sitting, 20 grammes (5 drachms) being rarely necessary.

Eucalyptol.—Lafage, of Neuilly, ⁶⁷_{Oct. 15, '92} has studied this substance, which is a combination of hydrochloric acid and essence of eucalyptus, solid in form, crystallized, white, with an odor resembling that of camphor. It is not soluble in water, but is soluble in alcohol, ether, chloroform, fatty and volatile oils, and petroleum. Administered to domestic animals, as the guinea-pig, rabbit, and dog, no toxic symptoms were produced by doses of 2 grammes (31 grains) in twenty-four hours, hypodermatically (in the rabbit and guinea-pig), and by 10 grammes (2½ drachms) by the mouth (in the dog). It is always well borne, and is eliminated by the bronchial and salivary secretion without regard to the mode of administration. Clinical experiments showed a favorable action in acute and chronic bronchitis, and as an intestinal antiseptic and disinfectant.

Euphorin.—G. Cao ⁵⁸⁹_{Nos. 18, 19, 21, '92} considers this drug an excellent

one, (1) as an antizymotic and bactericide, more powerful than carbolic acid; (2) as an antipyretic, superior to antipyrin in rapid and energetic action; (3) as an antineuralgic and analgesic, in migraine, neuralgia, and the osteocopic pains of syphilis; (4) in acute or chronic articular rheumatism, in which it is sometimes superior to the salicylates; (5) as a substitute for iodoform, being fully as effective and at the same time less toxic; (6) as a disinfectant and cicatrizing agent, in burns, etc.; (7) as an anodyne and curative agent in herpes and aphthous stomatitis; (8) as a remedy in venereal affections, in which it is far superior to iodoform, iodol, salicylic acid, resorcin, and chloral hydrate; (9) as a remedy in various cutaneous affections, especially of parasitic origin, such as trichophyton, favus, tinea tonsurans, etc.

Europhen.—J. Goldschmidt¹¹⁶_{Apr.} has used europhen in three cases of leprosy. In two, intra-nodular injections were used with excellent local effect, the nodules diminishing to one-half or two-thirds of their original size. This effect, however, was only temporary, as they regained their size several months later, and the progress of the disease was in no way affected. The third case was treated for ten months by means of frictions three times a day, lasting five minutes each time. A 3-per-cent. oily solution of europhen was used in all parts affected by the lesions, the oil remaining upon the skin, so that the latter was continually bathed with the medicament. The nodules completely disappeared; the skin became normal, flexible, and freely movable, there remaining only a slight black pigment. The general health was ameliorated, and there was no recurrence five months after cessation of treatment. In each case the diagnosis was verified by bacteriological examination. The injections are more painful than the frictions, but the latter require much more care and perseverance on the part of the patients. The author warmly recommends a trial of the drug in leprosy.

C. Kopp¹¹⁶_{Mar.} has found europhen of service in venereal diseases, and especially in soft chancre, in which recovery took place in seventeen days. It is of great value as an application to surfaces where there is abundant secretion. Either the powder alone, or combined with boric acid, can be used, there being no irritation of the surrounding parts. Good results are obtained as soon as with iodoform, to which it is superior on account of the absence of odor

and of irritating symptoms. In several cases the author applied euophen previous to curetting the chancre. It was of equal value in the treatment of buboes following soft chancre, curettage, hæmostasis, disinfection with sublimate and powdering with euophen being the method adopted. Cure took place in from fourteen to thirty-two days. The drug may replace iodoform with advantage in the treatment of venereal ulcers.

Exalgin.—R. v. Weismayer⁸_{No.9} has tried the analgesic action of exalgin on thirty-one subjects. He prescribed it either in powder, ten wafers, each containing 0.25 gramme (4 grains), one to four wafers per day; or, more frequently, after the following formula, recommended by Désire:—

R Exalgin,	0.25 to 1 gramme (4 to 15½ grains).
Alcohol,	9.5 grammes (2½ drachms).
Syrup of poppies,	10.0 grammes (2½ drachms).
Distilled water,	20.0 grammes (5 drachms).

The following are the author's conclusions: 1. In apyretic subjects exalgin, administered in doses of 0.5 to 1 gramme, produces no accidents. The vomiting in one case (that of cancer of the lip) ceased by discontinuing the treatment. The sensation of vertigo and intoxication in another case (cardiac lesion) was of no importance and lasted only a few minutes. 2. That doses of 0.5 to 1 gramme (7¾ to 15½ grains) did not influence either the pulse or temperature. 3. That the analgesic action of exalgin, while being less certain than the hypnotic action of morphine or the antifebrile action of antipyrin is, nevertheless, pronounced in rheumatism and neuralgia. 4. This analgesic action completely fails in the pains caused by inflammation or stasis in the parenchymatous organs. 5. The analgesic action manifests itself ordinarily only after several days. Neuralgia is the most rapidly relieved. In a case of gastralgia the pain ceased soon after the administration of the drug. The author recommends a trial of the drug as an analgesic. Joris¹¹⁶_{Dec., '92} successfully used exalgin in a grave case of chorea in a girl of 7 years. All other treatment had been useless. The drug was given in three daily doses of two pills, containing 0.08 gramme (1¼ grains) each. The choreic movements diminished twenty days after treatment was begun and ceased completely in four weeks. The general health was excellent, sleep and appetite being altogether normal.

Moncorvo ⁶⁷³_{Oct., '92} observed marked analgesic effects in twenty-one children from 1 to 12 years of age, to whom exalgin was given for various painful affections. In every case the remedy was well tolerated. The accidents (intoxication, giddiness, tinnitus aurium, etc.) sometimes observed in adults were never noted in children under the author's care. It was at first given in daily doses of 5 centigrammes ($\frac{7}{8}$ grain), increased gradually to 50 centigrammes ($7\frac{1}{2}$ grains). Having a very pleasant taste, it may frequently be administered in substance applied directly upon the base of the tongue, or in wafers in diluted wine or spirits. A given dose of exalgin, according to Moncorvo, is five times as effectual as an equal dose of antipyrin. Younger, of Hanwell, ⁶_{Apr. 8} has used the drug in cases of insanity and cerebral disease. Observing the good results obtained from its use in simple neuralgia, he decided to try it in the symptomatic neuralgia of cerebral troubles consecutive to a neuropathic condition or to pregnancy. He met with the greatest success with doses not exceeding 0.10 or 0.15 gramme ($1\frac{1}{2}$ to $2\frac{1}{4}$ grains). He then tried it in mental diseases. Daily doses of 0.05 to 0.15 gramme ($\frac{7}{8}$ to $2\frac{1}{4}$ grains) caused the suggestive symptoms to disappear gradually, as well as the violent pain of which the patients complained. Younger also cites an interesting case of an epileptic, who, following a blow upon the head, suffered from repeated attacks, in spite of the use of bromide of potassium in large doses. 0.40 gramme (6 grains) of exalgin were administered daily, and in a short time the number of attacks diminished and finally disappeared. The author advises a trial of the remedy in epilepsy and in insanity.

Marandon de Montyel, ⁶⁷_{Apr. 30} physician to the insane asylums of the Seine, has had different results. He tried antipyrin and exalgin in a large number of cases. He reports over four hundred observations, in patients suffering from mania with hallucinations. Antipyrin in doses of 5 to 6 grammes ($1\frac{1}{4}$ to $1\frac{1}{2}$ drachms) daily and exalgin in doses of 1 gramme ($15\frac{1}{2}$ grains) or more in twenty-four hours was given without any good results, and even with harmful effects at times. The exalgin especially showed a special denutritive action, and the author therefore deprecates its employment in mental disease. W. Krauss, of Buffalo, ¹_{Dec. 10, '92} states that in the treatment of nine cases of neuralgia, of different varieties, facial, sciatic, intercostal, etc., etc., the administration of the medicament

was followed by no relief, and a similar result was observed in two cases of chorea. The author, therefore, concludes that exalgin is far from meriting the praises bestowed upon it, and that it is, in fact, of little value in relieving pain.

Formanilid.—Formanilid ($\text{HCOAzHG}_6\text{H}_5$) is the homologue below acetanilid (antifebrin),— $\text{GH}_3\text{COAzHC}_6\text{H}_5$. Its physiological properties may be estimated by its chemical constitution, and its antipyretic qualities from the formula. The drug was the subject of an interesting discussion before the Medical Society of Budapest. ¹¹³_{Mar. 5} Preisach tried it in nine cases in the throat by insufflation. It caused complete anæsthesia, and the patients were able to swallow without pain. It was more efficacious than cocaine, the anæsthesia lasting longer—on an average from two to twelve hours, and in the majority of cases from ten to twelve hours. There was, at the same time, loss of reflex excitability. There was noted as a secondary symptom in one case, only, an increase in the heart-beats and a feeling of depression. Meisels used formanilid for anæsthesia of the urethral mucous membrane, and in several operations, using for the latter subcutaneous injections of 1 cubic centimetre ($15\frac{1}{2}$ minims) of a 3-per-cent. solution. Anæsthesia was rapid. Tanszka prescribed it as an antipyretic and antineuralgic, and regards it as equal to antifebrin and antipyrin, and sometimes not inferior to morphine. Bokai believes the vasomotor action to be superior to that of antipyrin, and that the drug may be advantageously used in all painful inflammations, as of the tonsils, pharynx, etc. Neumann studied in himself and in one of his colleagues the anæsthetic action of formanilid in a 20-per-cent. solution. Placed upon the tongue it caused first a biting sensation, then paleness, then anæsthesia. Although inferior to cocaine, it was found superior to antipyrin.

Formic Aldehyde.—Valude and Dubief, ¹⁷_{June 3} of Paris, have experimented with this new antiseptic in ocular therapeutics. This substance is particularly endowed with aseptic properties; it is much less of a microbicide, and therefore arrests the development of microbes rather than destroys the germs already present. It is this property in particular which renders formic aldehyde precious to the oculist, since it may be used as an antiseptic preparatory to the operation. Its principal qualities are due to its great diffusibility and to its antiseptic properties, which are greater than those

of corrosive sublimate. For ordinary usage in ocular surgery solutions of 1 to 2000 are employed; the 5-to-1000 solution is used for antiseptizing the instruments. In cases of ocular suppuration, purulent conjunctivitis, most brilliant results are obtained by the instillation of drops of a 1-to-200 and even of a 1-to-100 solution. It may also have another use. Since it does not change the different alkaloids, a 1-to-2000 solution may be employed in making aseptic eye-washes, either with atropia, cocaine, or eserine, which may be preserved without change during a long time.

Galega Vera.—V. R. Dorreta²⁰²_{No.2} recommends, in cases of rachialgia following renal lesions, the following treatment: 2 or 3 drops of perchloride of iron in a little water and 8 to 10 drops of sweet spirits of nitre, and after meals a dessertspoonful of the decoction of the leaves of *Galega vera* (an indigenous plant of southern Europe). This is also an excellent tonic, and gives better results in anæmia than any other medicines used.

Glycerin.—Injections of a small quantity of glycerin are only of value when the rectum is filled with fæces, the evacuation taking place physiologically; that is, without diarrhœa. From this fact Anacker⁶⁹_{No.19} is led to conclude that injections of glycerin act very well in habitual constipation due to sedentary life, alimentation, etc. They are of very little value, however, in cases where there is mechanical obstruction, in constipation following febrile, cerebral, or medullary affections. Glycerin injections are of value in irreducible hernia, and should be used from the beginning. Injections of glycerin, according to this author, are superior to suppositories. If made for some time at a given hour of the day, spontaneous evacuation of fæces will eventually take place and the glycerin can be suspended. The injections are also useful during parturition, hastening the pains and the conclusion of the labor. The method should be tried in obstetrical clinics and the results published. In certain cases from 5 to 10 drops of glycerin are sufficient for an injection, which is therefore cheaper than all other purgatives. A syringe should not be used, as there is danger of wounding the mucous membrane. Glycerin when thus employed, even for long periods, gives rise to no unpleasant symptoms.

Guaiacol.—Liebreich¹¹⁶_{May; July 22}² states that, whereas guaiacol has hitherto been described as a liquid, the latest researches have shown that, when pure and synthetically produced, it is a solid body, crys-

tallizing in colorless prisms, which melt at 28.5° C. (83.3° F.), boiling taking place at 205° C. (369° F.). It is most readily dissolved in pure, undiluted glycerin, the solubility in water being only 1 to 50. Both this preparation and its derivatives have hitherto rarely been produced absolutely pure, and this is said to account for the different descriptions published, many of the trade samples of the preparation containing only about 50 per cent. of guaiacol.

L. Bard ²¹¹ _{June 4; Aug. 80} details four cases of tubercular disease in which the local application of guaiacol caused a marked reduction of the temperature. In one of these cases the patient experienced from the beginning a marked amelioration; and not only did the drug keep the temperature down, but the appetite returned, and in a short time the sufferer, considering himself cured, left the hospital. Pure guaiacol being a liquid body, of slightly syrupy consistence, it may be painted over the thigh or the back, the part being covered with an impermeable towel. Dosage can thus easily be managed. The quantity employed at the beginning was 3 grammes ($\frac{3}{4}$ drachm), this amount being decreased at each treatment. Thus applied, the drug did not cause any irritation of the skin. According to the author, the antipyretic action of guaiacol, employed as described, is not confined to tuberculous cases. The medicament has given the same satisfactory results in other pyrexias, such as in that of erysipelas and pneumonia. The drug (with the exception of one of the tuberculous cases) never produced albumen in the urine. The albuminuria present in this case was not modified by the agent. On the whole, the therapeutic method described, as regards the local use of guaiacol to reduce febrile temperatures, is encouraging and worthy of further trial.

The ordinary methods of administering the drug in tuberculosis presenting considerable inconvenience, S. Sciolla ⁶⁹ _{No. 22} had recourse to the endermic method. He applied from 2 to 10 grammes ($\frac{1}{2}$ to $2\frac{1}{2}$ drachms) of guaiacol to the extremities, back, and abdomen, and covered this with cotton and gutta-percha. The action of the drug was manifested even in fifteen minutes; the patient tasted the guaiacol and the temperature began to fall. The first traces of the drug appeared in the urine in about an hour, the maximum amount appearing in from five to six hours. There was no irritation of the skin if the drug was of pure quality.

The temperature fell gradually in from four to six hours,—as much as 2° or 3° C. (3.6° or 5.4° F.),—but rose afterward. Similar results were obtained by the author in various febrile affections. Devoto, Maragliano, Campana, and Mosso spoke favorably of this method of administering the drug.

Robillard, of Lille, ⁹²⁷_{July} has also made investigations concerning this drug when applied over the cutaneous surface. It was used in febrile tuberculous cases in doses varying from 0.50 gramme ($7\frac{1}{2}$ grains) to 2 grammes (30 grains). The applications were made to the skin covering from one to five square decimetres (five to twenty-five square inches). In all the cases observed the temperature became rapidly lowered, this decrease lasting quite a long time. The portion of the skin selected is of no importance; it may either be upon the back, the breast, the arms, or the thighs, without causing any appreciable difference. The patients feel some slight inconveniences after these applications; they complain of a decided taste of guaiacol in the mouth and of very profuse perspiration. It is therefore probable that the remedy is absorbed through the skin. The urine is more abundant than in the normal state, and does not usually contain traces of guaiacol.

Gymnema Sylvestris.—This plant is recommended by Quirini ²⁹⁶_{Mar. 24} for the purpose of producing loss of taste. It contains a substance—gymnemic acid ($C_{32}H_{55}O_{12}$)—which has the property, upon application to the tongue, of causing complete disappearance of taste for sweet and bitter things to such a degree that people are incapable of distinguishing quinine from sugar, while the flavors of acid, salty, astringent, and sharp substances are preserved without any alteration. Because of this singular property the author recommends, before the administration of bitter medicines, to rinse the mouth with a solution of 12 per cent. of gymnemic acid in water and alcohol. It is a whitish-green powder, of acid, acrid taste, very soluble in alcohol and but slightly soluble in water or ether.

Hæmol and Hæmogallol.—T. Lang ⁵⁷_{No. 2} used these preparations with advantage, the latter in anæmia due to various causes, such as neurasthenia, cardiac disease, dyspepsia, and the anæmia of obesity, and the former in chlorosis. The initial dose of hæmogallol, especially in patients with a weak digestion, was 0.05 gramme ($\frac{7}{8}$ grain) a quarter of an hour before meals, either pure

or in a teaspoonful of water with sugar. The dose is gradually increased to 0.9 gramme ($1\frac{1}{2}$ grains) and over. The constipation caused by the drug in chlorosis is obviated by pastilles of cascara sagrada. Kept in well-corked bottles in a dry place, the drugs keep well, and patients take them without reluctance.

Hydrastinine.—Hansemann ¹¹⁶_{Dec., '92} recommends hydrastinine in all cases where atropine is contra-indicated, as, for instance, in the neuroses, where the use of atropine is sometimes followed by convulsions. He prescribes the hydrochlorate in wafers of 0.025 gramme ($\frac{1}{2}$ grain).

Wild ⁶⁹_{No. 13} reports several accidents due to the administration of this drug, particularly in the pharyngeal region. He describes the case of a female patient, aged 39 years, suffering from uterine hæmorrhages, which persisted after the use of all the usual remedies. The author gave subcutaneous injections of a 10-per-cent. solution of hydrastinine, each injection of 1.00 cubic centimetre ($15\frac{1}{2}$ minims) containing 0.10 gramme ($1\frac{1}{2}$ grains) of the remedy. Seventeen injections were given in forty days. At the moment of the last injection the patient complained of a violent pain in her neck. An examination revealed the presence of limited patches projecting about two millimetres above the surface. During the following days these patches became much larger and more prominent, and the mucous membrane surrounding them became much inflamed. The pain in the neck increased, extending to the ears, and entirely preventing alimentation, as the act of swallowing caused such intense pain. Wild suspected that the hydrastinine was the cause of these symptoms, and, in order to ascertain positively, gave another injection of the drug after several days. The following day the same phenomena occurred with the same intensity. The author does not hesitate to attribute these symptoms analogous to those produced by atropine, and, no doubt, originating from paralysis of the secretory nerves to hydrastinine. It is, therefore, a remedy whose effects should always be carefully watched, and the throats of patients examined after its use.

Hydrastis Canadensis.—Olszenski ⁶⁵⁰_{Apr. 6} has tried the fluid extract of *hydrastis Canadensis* in ninety-three cases of various diseases, such as pleurisy, pleuritic effusion, intermittent fever, articular rheumatism, and different lesions of the heart. Among the number were seventy-three cases of pulmonary phthisis, in seventy

of which he was able to summarily arrest the sweats. If 20 to 30 drops during the night did not prove sufficient, he gave from 25 to 30 drops of the fluid extract two or three times during the twenty-four hours. The sweating recurred after a certain time in several cases, when the drug was again administered. The only secondary effect observed was vomiting in two cases, necessitating the suspension of the drug.

Luigi Borde⁴⁷²_{Dec., '92} conducted a series of experiments to determine the action of hydrastine upon the uterus in normal labor, and in the hæmorrhages of parturition. He concludes that the drug has no influence upon the physiological loss of blood during and immediately after labor; that it has no influence upon the evolution of the uterus; that its action upon the lochia is slight; that it lessens the frequency and intensity of the pains, especially in multiparæ; that it does not arrest puerperal hæmorrhage; that it exerts no influence upon the expulsion of clots from the uterus.

Hydrogen Dioxide.—See Oxygenated Water.

Hypnal.—This drug, introduced by Bardet in 1890, has recently been tested by Herz,^{116 166}_{Mar., July} under Filehne's direction. It contains 45 per cent. of chloral hydrate and 55 per cent. of antipyrin. It is recommended in the milder forms of excitement, in commencing delirium tremens, in chorea, and in "essential" insomnias. The drug took effect in 20 to 30 minutes, the dose for adults ranging between 15 to 45 grains (1 to 3 grammes). It is best given in 10-per-cent. solution in water, and its slight taste can be covered by a syrup of orange-peel or by an aromatic tincture.

Hypnotism.—Regnault¹⁴_{July 23} describes a case of monoplegia of the left leg with amenorrhœa lasting one year, cured by suggestion. There was local anæsthesia, and pricking of this region caused no flow of blood. The author suggested to the patient, while under the influence of the hypnotic sleep, that she must be cured by massage. After three *séances* the patient was completely cured. After the first treatment she was seized with violent menorrhagia, lasting fifteen days. At the same time sensibility returned to the affected parts, blood flowing upon being pricked with a pin.

Henry Hulst, of Grand Rapids, Mich.,⁵⁹_{Mar., 4} reports 422 cases in which he obtained very good results, the best effects being observed in diseases accompanied by pain. The author rejects the general opinion that a certain degree of mental weakness predisposes to

the influence of hypnotism, and finds, on the contrary, that hypnotism is induced with difficulty in such individuals, and when induced is always superficial. If the mental symptoms, hallucinations or illusions, are improved or disappear, the patient may become a good subject for hypnotism. Among the persons found refractory to suggestion by the author were two cases of hysteria. He regards the treatment as of great value in correcting vicious habits in children, and cites several cases of this kind. As regards the case with which hypnotism may be induced, he reports one case in which he succeeded in hypnotizing the patient through the telephone.

Osgood ⁸⁰⁸_{June} states that success depends largely upon the patient himself. In chronic cases improvement by suggestion may occur at once or come on gradually; generally these cases are less amenable to suggestion than acute ones. The number of treatments depends upon each case, and no rules can be formulated. A small number of subjects cannot be influenced, but if hypnotism can be produced the results are always favorable. The method is of great value in children, and also in dental operations. In operations of some gravity, however, the fear of the patient outweighs any other influence, and hypnotism does not succeed. The author has found it generally more difficult to influence his private patients than those in hospital practice.

Ichthyol.—L. Herz ⁸⁴_{No. 2} warmly recommends a 2-per-cent. solution of ichthyol as a gargle in anginas of almost every kind, except the follicular variety. The mouth and throat are to be carefully gargled, and a portion of the solution then swallowed, no burning sensation being experienced. The odor and taste of ichthyol are not very agreeable, but neither persists for any length of time. Under this treatment the pain rapidly disappears, and the tumefaction of the throat and tonsils diminish so much in twenty-four hours that the patient begins to eat without difficulty. In the author's cases the hard and soft palates were so swollen that the patients could scarcely open their mouths. R. Hermann ²⁰¹⁴₉₂ treated by ichthyol 150 cases of women suffering from various affections, 142 being of the genital organs. Tampons saturated with glycerole of ichthyol (10 per cent.) were used, and the drug was administered internally at the same time in pills of 0.1 gramme (1½ grains), from one to six daily being taken. The disagreeable odor

may be disguised by a 1- to 2-per-cent. essence of citronella or essence of eucalyptus. Of 22 cases of inflammation of the uterus there were 12 cures, 9 were improved, 2 failures; of 120 cases of peri-uterine inflammation, 59 recoveries, improvement in 56, 5 failures; 2 cases of fissure of the breast, rapid cure; 6 cases of inoperable cancer, considerable diminution of the fetid secretion. The author especially recommends ichthyol in inveterate uterine cancer.

Damiens ²⁰¹²_{92; June 15} recommends ichthyol hypodermatically, and states that it possesses, under these circumstances, analgesic properties, as there is, in addition to the absorption of the swelling, a suppression of the pain. Particularly is it of value in cases of neuralgic pains associated with inflammatory processes which have caused exudations. Hypodermatic injections of ichthyol are not equal in analgesic power to hypodermatic injections of morphine, but they are very much more innocuous.

Iodide of Potassium.—According to G. Zielinski, ⁶⁷³_{July} iodide of potassium and sodium can be employed with advantage in the chronic forms of croupous pneumonia and the pneumonia following or complicating influenza, beginning on or about the twelfth day of the disease,—and, under certain conditions, even earlier,—in doses of 1.5 to 2.0 grammes (23 to 30 grains) per day for adults, and proportionately smaller ones in children. The crisis and lysis appeared, in many cases, on the second or third day of treatment. The iodides cause the disease to reach sooner a favorable culmination; prevent complications owing to their effect upon pneumococci and upon inflammation, or, rather, the biological product—pneumotoxin; and favor to a considerable degree the regressive metamorphosis of the products of inflammation and their removal, partly by absorption, partly by expectoration.

The government commission at Chicago ⁵⁹_{Jan. 21} have obtained a proportion of 63 per cent. of recovery with iodide of potassium prescribed for actinomycosis in beef cattle. In consideration of the results obtained, the treatment was very profitable. V. Heron ¹¹³_{Jan. 6} has cured, with iodide of potassium, two cases of actinomycosis in man, one a tumor occupying all the submaxillary region, and one the region of the cæcum, considered at first as a perityphlitis. The doses were 0.5 to 2 grammes ($7\frac{3}{4}$ to 31 grains) per day in the first case (in all 250 grammes—8 ounces) and 1 gramme ($15\frac{1}{2}$ grains) per day in the second case, for sixteen

days. In the last case the diagnosis was confirmed by microscopical examination of the yellow clots of pus.

Volkoff and Stadnitzki, of St. Petersburg,⁵⁸⁶_{No. 11} have made experiments, at the clinic of Professor Tchoudnouski, with the object of studying the influence of the iodide of potassium upon the general nutrition,—a very important question from a therapeutic stand-point. The following are the results of the experiments, which were made upon young persons of from 20 to 25 years of age, who took daily two doses of 0.30 gramme (5 grains) each:

1. The assimilation of the carbohydrates in the food is but slightly diminished.
2. The nitrogenous exchange is augmented.
3. The oxidations in the organs are diminished; the quantity of carbohydrates in substances not sufficiently oxidized, as well as the quantity of neutral sulphur, is increased.
4. The destruction of organic albumen is increased, to judge by the augmented quantity of sulphur in the urine.
5. The weight of the body is only slightly diminished.
6. The diuresis is increased.
7. The assimilation of fat is diminished to a very slight extent.

Iodine Trichloride.—Belfield²⁴⁵_{Aug., '92} has obtained good results in the treatment of two cases of vesical tuberculosis and one of tubercular epididymitis by a 5-per-cent. aqueous solution of iodine trichloride.

Iodoform.—G. Vulpius⁵⁷⁵ has endeavored to determine definitely the solubility of iodoform in alcohol and ether. The various pharmacopœias differ on this point, the result being great uncertainty in preparation. The author found that at a temperature of 18° C. (64.5° F.) 67 parts of alcohol at 95 per cent. are required to dissolve 1 part of iodoform, while at the boiling-point 9 parts at 95 per cent. are sufficient to dissolve 1 part; of ether, 5.6 parts are required to dissolve 1 part of iodoform.

Reginald H. Lucy²_{Jan. 7} gives the following formula for an iodoform emulsion for injection into tuberculous fistulæ: Iodoform, 3 parts; starch, 1 part; mix until a fine powder is obtained and add glycerin, 20 parts; water, 12 parts; heat gradually, stirring the mixture constantly, up to 133° C. (271.4° F.). The emulsion of 10 per cent. thus obtained is very stable, while that ordinarily prepared by triturating iodoform in glycerin and heating is very unstable, the iodoform soon precipitating. Oily and other solutions are less effective than that proposed by the author.

Stubenrauch^{336 112} says that the iodoform-oil is of more value to the average physician than the iodoform-glycerin mixture, because of the ease with which it can be prepared and sterilized. The sterilization of the latter, however, may be done as follows: The glycerin should be heated by itself, and after it has been allowed to cool the proper amount of iodoform should be added. The advantages of this method are that the iodoform is not decomposed by the heat. According to Schimmelbusch, bacteria multiply with great difficulty when glycerin is used as a culture medium; therefore, the iodoform-glycerin mixture is prepared with heat. Krause adds a little carbolic acid to the mixture, and thus renders it antiseptic.

Iron.—The pharmaceutical preparations of iron, while not being absorbed by the intestine, according to the researches of Walther and others, favorably influence the general condition in chloranæmia. Bunge has advanced the theory that they owe their action to the fact that they prevent in the intestines too energetic decomposition of the organic elements of iron in the food, thus permitting their introduction in sufficient quantity into the organic juices. This conserving action of the pharmaceutical preparations of iron may be due either to their combination with the excess of sulphuretted hydrogen in the intestine in chloranæmia (which is generally accompanied by constipation), or to their influence upon the microbes causing intestinal decomposition. The energy of the putrefactive process in the intestine may be estimated by the relation existing in the urine between ethero-sulphurous and sulpho-sulphurous acids. (Baumann, Morax, Bartachevitch, and others.) To elucidate this question G. Th. Morner^{586 No. 23} made the following experiment upon himself: For eight days iron was not taken; for eight days following, seven pills, each containing 0.15 gramme ($2\frac{1}{2}$ grains) of chloride of iron, were taken daily; for eight days more the daily number of pills was increased to twenty, making 3 grammes (46 grains). Iron was then suspended for four days, and for the last eight days 3 grammes (46 grains) of lactate of iron were taken. During the entire experiment the diet was as uniform as possible, care being taken not to introduce sulphates with the food or drink, as in mineral waters. The figures given by the daily analysis of urine (the author usually divided by two the figure obtained for the urine of two days), as to the relation

of sulpho-sulphurous and ethero-sulphurous acids, did not differ notably during the experiment, as shown by the following table :

Periods.	Sulpho-sulphurous acid.	Ethero-sulphurous acid.	Relation of first to second.
I, . .	3.723 grammes.	0.348 gramme.	1 : 10.7
II, . .	3.423 "	0.341 "	1 : 10.0
III, . .	3.498 "	0.322 "	1 : 10.8
IV, . .	3.925 "	0.351 "	1 : 11.1
V, . .	3.455 "	0.328 "	1 : 10.5

The author concludes that iron, even in large doses, does not diminish intestinal decomposition, and that it must be admitted that its action is limited to its combination with sulphuretted hydrogen, which can then no longer exercise any influence upon the ferric constituents of the food.

N. Rosenthal ¹¹⁶_{Dec., '92} affirms the value of *perchloride of iron* in preventing the spread of diphtheria from the pharynx to the larynx. He prescribes the 2-per-cent. perchloride in glycerin, to be given hourly, night and day, in teaspoonful or dessertspoonful doses. It may be safely employed in children of all ages, its taste being so pleasant that the little patients take it cheerfully. It does not disturb the digestion, even if taken for a long period. Its only disadvantages are that it darkens the teeth and injures the linen ; but a little care will avoid these inconveniences, trifling in view of the favorable effects of the drug. Under its influence the fever disappears in twenty-four hours, the pulse becomes normal, the general condition is good, the pains in the throat are insignificant, and the appetite is preserved. The fetid coating on the tonsils becomes thick, membranous, and inodorous within twenty-four hours, and in a few days becomes detached. Convalescence is short. The author also recommends the drug in localized pharyngeal diphtheria, as at once preventing its extension to the larynx and general infection of the organism.

T. Huebner ¹¹⁶_{Dec., '92} has also had recourse to perchloride of iron in diphtheria, applications being made twice daily if the cases be light, and three times daily if they be serious. He uses the drug either in a pure state or in one-half or one-fifth solution. The results were excellent, six cases having been cured by this treatment, which were suffering from consecutive œdema, always the precursor of a fatal issue. The healthy adjoining tissue is not injured by the treatment.

Jambul.—Vix ¹¹⁶_{Apr.} has used the extract of jambul in the treat-

ment of glycosuria, using the rind instead of the fruit in its preparation. This he found to be more agreeable in taste and much cheaper than the fruit. As much as 50 grammes ($1\frac{1}{2}$ ounces) per day can be administered for a long period without disagreeable effects. It is best given in water or wine. The author met with success in its use in twelve cases, though it is true that the patients were at the same time submitted to a strict diabetic diet. Under its influence the quantity of sugar in the urine diminished in a short time, the general condition was notably improved, and grave cases became light in character. It is needless to say that jambul alone will not cure diabetes; but it may be of great service in relieving the patients and in making life tolerable to them. It should be administered after meals, as taken fasting the drug may provoke nausea in sensitive patients.

Kumyss.—Thominski⁵⁸⁶_{No. 47, '92} has observed the influence of kumyss on menstruation in three cases, one of which deserves particular attention. A woman, 39 years old, in the last five or six years menstruated every ten days or two weeks, the flow lasting seven to nine days, and being very abundant. In the years 1889 and 1890 she was treated by specialists for endometritis fungosa; but she did not consent to scraping, and only used hæmostatic injections, but without effect. She went to Samara, where she drank kumyss from June to July 20th. During the kumyss treatment menstruation set in every five or six weeks; her strength improved; the quantity of blood lost was considerably diminished. Now she menstruates every three weeks, and in less degree than formerly; so that she does not see any necessity for undergoing special treatment. Besides two other instances of good effects of kumyss on irregular menstruation, the author has seen one case of arrest of profuse epistaxis.

Levulose.—Kuelz⁷⁴⁴_{Apr. 29} advises levulose in the alimentation of diabetics. He claims that inuline and levulose are entirely assimilated by diabetics, while grape-sugar is more or less completely eliminated by the urine. Worm-Müller has not been able to discover a trace of levulose in the urine in cases in which it had been abundantly ingested. It has hitherto been impossible to prescribe it on account of the difficulty of preparing it free from dextrose; but Schering has recently invented a method of preparation by which the levulose is obtained in a granular mass, soluble in

water, sweet, and leaving no disagreeable after-taste. In sweetening power it is superior to cane-sugar.

Losophan.—Saalfeld³⁵⁷_{Jan.17} has used losophan as an ointment or in a liquid alcoholic solution. It influences favorably most mycotic dermatoses, tinea tonsurans and sycosis, in a solution of 1 part of losophan to 70 parts of alcohol and 25 parts of water, or a salve of 1 to 30 in vaselin. In scabies good results were also obtained by the use of a salve of 3 to 5 parts of losophan to 100 parts, though the treatment was not found superior to other methods. It was efficacious in 1-per-cent. ointment in several cases of chronic infiltrated eczema, acne vulgaris, and rosacea. In one case an inflammation supervened so rapidly that recourse to antiphlogistics was necessary; in another case tolerance was established and the treatment became inactive. It entirely failed in psoriasis vulgaris and indurated chancre, its desiccating power being very slight. It is contra-indicated in all acute inflammations of the skin; even in diluted solutions its use provokes notable irritation in such cases.

Maltine with Peptones.—Graeme M. Hammond, of New York,¹_{Dec.3,'92} shows that in certain nervous affections, as epilepsy, and particularly the infantile type of the disease, there are troubles of nutrition against which the physician must always be on guard, bestowing great care upon the alimentation of the patient. In such cases he employs the peptones and maltine simultaneously; the peptones represent the nitrogenous food, while the maltine greatly facilitates the digestion of amylaceous substances. This medication should be allied with a strict milk diet in children, great benefit resulting therefrom. Hammond praises the same *régime* in individuals suffering from neurasthenia or from digestive troubles of nervous origin.

Medicaments introduced per Rectum discharged by the Mucous Membrane of the Stomach and in the Urine.—P. G. Kandiodoff,⁵⁸⁶_{No.13} after experimenting on young persons with various drugs, arrived at the following conclusions: 1. Iodide of potassium, bromide of potassium, hydrochlorate of quinine, salicylate of soda, arsenicum and antipyrin, introduced into the rectum, are discharged by the mucous membrane of the stomach. 2. The discharging of all these substances in the stomach, with the exception of quinine, begins almost as quickly (one-fourth to one-half hour) as its appearance in the urine; it lasts without interruption,

and ends somewhat sooner (thirty-six to forty-eight hours) than in the urine. 3. The discharge of quinine by the mucous membrane of the stomach begins somewhat later than its elimination by the kidneys; it lasts from two to eleven hours, and almost coincides with the time of the greatest discharge of the quinine by the kidneys. 4. Tannic acid could neither be discovered in the contents of the stomach nor in the urine. Comparing these results with those already known as to the discharge into the stomach of morphia, corrosive sublimate, carbonate of ammonia, and of snake and cholera virus, it may be concluded that the mucous membrane of the stomach takes part in the elimination from the body of some medicines as well as pathological products, which either enter the body from the outside or are formed in the body itself.

Menthol.—Colombini¹¹³_{May 7} has used menthol with success in all pruriginous affections of the skin, especially when aggravated by scratching, as in urticaria, some varieties of eczema, and scabies. He prescribes a 5-per-cent. alcoholic solution, a 10-per-cent. oily solution, ointments of 1 to 6 per cent., and powders of 2 to 6 per cent. Care must be taken not to apply too concentrated solutions to the irritated surfaces or the mucous membranes, as a very intense sensation of burning may be caused; and also not to make too extensive applications at once, on account of the disagreeable sensation of cold. As the itching is but a symptom of the disease, it is of course necessary to prescribe for the latter, as the menthol relieves only the itching.

Mercury.—P. Palma¹¹⁶_{Mar.} reports the results of his studies on the action of *calomel* in hepatic affections with ascites, without ascites, and in secondary hepatic affections. Of the 6 cases of hepatic cirrhosis with ascites submitted to treatment by calomel, diuresis increased considerably in 4 cases, while the other morbid symptoms diminished. In 2 cases want of success was due to the fact that the hepatic lesions were too far advanced. In 2 cases without ascites (1 of hypertrophic cirrhosis and 1 of primary carcinoma of the biliary vesicles), but slight polyuria was provoked by the calomel. In 1 case of secondary hepatic disease (cancer of the pylorus and secondary cancer of the liver) with considerable ascites, the diuretic action of the drug was very pronounced. The patient would no doubt have died of cachexia, but by the use of calomel his sufferings were greatly relieved, and, moreover, the

disappearance of ascites permitted a positive diagnosis. As regards secondary effects, stomatitis in one case yielded rapidly to appropriate treatment. The diarrhœa which may occur is easily controlled by tincture of opium. The best method of administration is to prescribe it for three consecutive days in wafers of 0.2 gramme ($3\frac{1}{4}$ grains) three times daily. It should be discontinued for one or two days and resumed for three days, as long as necessary. L. Sior^{No. 62, 92} obtained excellent results from the use of calomel in a case of hypertrophic cirrhosis in a man of 30 years. He administered it in the following manner: During the first month, 0.05 gramme ($\frac{7}{8}$ grain) six times a day (every two hours), every three days of treatment being followed by three days of repose. The second month, four doses per day were given for three days, and again followed by three days of repose. The pain ceased, icterus disappeared, and there was a notable diminution in the size of the hypertrophied liver and spleen. It is to be noted that iodide of potassium entirely failed in this case.

To elucidate the question as to whether an articular affection is or is not of gouty origin, Grimm^{No. 69, 17, 18} used calomel. About fourteen years ago he prescribed it accidentally for a patient suffering from an attack of chronic gout, and on the following days an amelioration altogether remarkable was noticed in the condition of the affected joints, a diminution of the pains and the articular swelling. Since then Grimm has been able to demonstrate the value of this drug in twenty gouty cases. In only two did the medicine fail; in the others remarkable effects were rapidly produced, at first palliative, but followed sooner or later by a cure. He observed that in persons of a ripe age the beginning of an attack was often preceded by intestinal torpor. It is in such cases that the efficacy of calomel manifests itself in the most striking manner, its administration being followed by a cessation of the pains, and of the feeling of tension in the affected joints; patients who expected to be unable to move for some weeks find in two or three days that they are able to walk. The salutary effects generally begin to develop as soon as the colic (which determines its ingestion) is produced, and are the same as those in observed mechanical œdema. The calomel should be so administered as to at once produce energetic peristaltic contractions of the intestines, but should also be prescribed sparingly, as only one dose judiciously

administered will produce the desired effect, the size of the dose to be regulated by the susceptibility of the patient. An appropriate diet and hygienic measures should also be prescribed.

Watraszewski ²⁹⁷_{Apr. 12} recommends the use of calomel soap instead of gray ointment. This soap is prepared by triturating carefully the calomel by steam with potassic soap and olive-oil in the proportion of 1 to 3. Frictions are made with 2 grammes (31 grains) of this soap in the following manner: After having previously bathed the skin, the soap is placed upon it, and, having moistened the palm of the hand, friction is made by a circular movement, slowly, wetting the skin from time to time, until the soap becomes suds, and continuing until there is no trace of it left. The frictions should last from ten to fifteen minutes. The advantages of calomel soap are: (1) the frictions are easy and require little time; (2) it is inodorous, soiling neither the skin nor the clothing, so enabling the treatment to be kept secret; (3) it does not irritate the skin. As to its therapeutic action in old or new cases of syphilis, it is not superior to gray ointment. Examination of the urine shows the presence of mercury from the first days. Another fact which shows how readily the soap becomes absorbed is that in several cases, in spite of the greatest care taken to keep the mouth clean, a slight gingivitis appeared; and in some cases it was necessary to diminish the dose.

Jemma ⁵⁰⁵_{June 10}; ²_{June 24} having obtained excellent results from the intra-venous injection of *corrosive sublimate*, as practiced by Baccelli in some cases of cerebral syphilis, was encouraged to try the same method in some other infective diseases. He accordingly injected that substance into the veins of six patients suffering from typhoid, one from rheumatic fever, one from erysipelas, and one from tuberculosis. While careful not to draw any positive conclusions from so small a number of cases, he points out that in no single case were the injections (some three hundred in all) followed by the slightest ill effect. In the typhoid cases they seemed to do good. He used for the purpose a Pravaz syringe. The water in which the sublimate was dissolved was always previously sterilized and filtered several times; the quantity of sublimate used for a first injection was always 0.001 gramme ($\frac{1}{64}$ grain); the highest dose given was 0.004 gramme ($\frac{1}{16}$ grain). Jemma suggests that mercury may be advantageously administered in the

way described when a rapid effect is desired. He thinks this mode of administration preferable to subcutaneous or intra-muscular injection, both for its greater therapeutic effect and its painlessness.

Pilliet and Cathelineau, of Paris, ⁹²⁷_{Nov. 1, '92} have studied experimentally the lesions caused by bichloride of mercury. The kidneys showed a special alteration of the secretory epithelium, in three different degrees. In the first stage the renal cells and convoluted tubules remain striated, but their marginal portions become gradually filled with vacuoles, which in turn fill the uriniferous tubules with hyaline casts. There remains in the tubes a thin cytoplasmic margin circumscribing the casts, nuclei are rare, and the cells appear to be united by their lateral borders. In the second stage the nuclei have disappeared and the altered cells fill the uriniferous tubes, granular casts resulting. In the third stage the cells disappear as if swept out by the blood-current and entirely expelled. There remains only the connective raphé of the kidney, with the glomeruli slightly inflamed. There is intense congestion of the kidneys with glomerular hæmorrhage and hæmorrhage of the collecting tubules. The mucous membrane of the entire intestine is greatly congested. The epithelium undergoes a gradual necrosis and is sometimes eliminated entire. The liver shows lesions of the same nature; multiplication of the nuclei about the vessels, tumefaction, and necrosis of the cells, with elimination of the latter. In preparations made immediately after death, large, lace-like spaces are seen in the hepatic tissue, the parenchymatous elements having disappeared, leaving bare the connective raphé. Ecchymoses are also observed beneath the endocardium and intense congestion of the venous plexus of the spleen. In cases of sublimate poisoning in man, where the histological examination was very complete, alterations of the same nature were observed. The employment of corrosive sublimate in surgery makes these researches valuable and interesting.

Darier, of Paris, ⁴¹⁴_{Jan.} writes upon the danger of making large hypodermatic injections of corrosive sublimate. Fatal cases have been reported following these injections. He states that such accidents would not occur if only soluble salts were used, and but 0.005 gramme ($\frac{1}{12}$ grain) injected at a time. Having ascertained the average degree of tolerance of the patient, the dose may be gradually increased to 0.01 gramme ($\frac{1}{8}$ grain) every two days.

Gralevsky⁵⁸⁶_{No.25} treated by *gray ointment* three cases of human glanders, one generalized and affecting especially the thorax, the other two localized. The first case died the day after examination by the author. The other two received the infection from the first. The abscesses were incised and disinfected, and friction with the gray ointment (4 grammes—1 drachm) daily prescribed; 48 grammes ($1\frac{1}{2}$ ounces) were used in the one case and 200 grammes ($6\frac{1}{2}$ ounces) in the other. The disease had affected the back of the right hand between the thumb and index finger, the cutaneous fold between the two, and the posterior portion of the neck. Cure resulted in both. The author called attention to the following facts: 1. The disease was contracted by two adults, while three children who slept with the patient in whom the disease was fatal, kissing him upon the mouth, were not affected. 2. In each of these cases a most careful examination revealed no nasal lesions. 3. In spite of prolonged use of gray ointment no trace of stomatitis appeared.

H. Borntrager⁵⁶⁰_{No.25} recommends, for easily obtaining a mercurial ointment having 98 per cent. of metallic mercury, the trituration of the metal with the oleate; for preparing the officinal mercurial ointment there should be added to this concentrated ointment a sufficient quantity of soft animal fat. A small quantity of liquid mercury renders the mercurial oleate solid and easier to transport. It is only necessary to extract the oleate by ether to render the mercury liquid again.

Welander²¹⁴_{No.9} has observed that gray ointment is more efficacious if spread over the skin than if applied with friction. The following is the method recommended by him: In the evening, before bed-time, 6 grammes ($1\frac{1}{2}$ drachms) are spread upon the skin and covered with a compress of linen. The patient is covered warmly in bed, but not so warmly as to cause perspiration. The following morning the balance of the ointment is removed with hot water.

H. Koster¹¹⁶_{Feb} reports a case of paroxysmal hæmoglobinuria cured by mercurial injections. The patient was a man of 35 years, in whom the attacks came on without any previous disturbances of health, after forced marching, while cold seemed to have no influence. Having failed with tonics and quinine, and learning that the patient had contracted syphilis four years previously, the

author had recourse to *aceto-thymolate* of mercury, in doses of 0.06 gramme (1 grain). The results were excellent; after six injections the patients left the hospital completely cured. This case lends support to the theory that syphilis plays an important rôle in paroxysmal hæmoglobinuria.

Blaschko⁶⁹_{No. 43, '92; Jan. 27} reports two cases and refers to several others in which the intra-muscular injection of *mercuric salicylate* in liquid paraffin in the treatment of syphilis was followed by pleuritic pain in the side, dyspnœa, cough, blood-streaked expectoration, impairment of the pulmonary percussion-resonance, with the presence of moist râles on auscultation,—symptoms that he ascribes to the entrance of minute quantities of paraffin or of the insoluble mercurial salt into a vein, and thence into a pulmonary vessel, in which it becomes obstructed. In otherwise healthy persons the complication is attended with no serious results, but in tuberculous persons the consequences might prove injurious.

P. J. Froloff⁵⁸⁶_{No. 3} publishes a contribution upon the influence of intra-muscular injections of salicylate of mercury in syphilis, and upon the quantitative and qualitative exchange and assimilation of nitrogen. He examined eleven syphilitic patients for this purpose, two control patients being given pure vaselin. Besides the time required to obtain the necessary equilibrium by means of diet, each experiment lasted from twelve to fifteen days. The following results were obtained: 1. Intra-muscular injections of salicylate of mercury increase the exchange of nitrogen in patients suffering from condylomata, sometimes to a notable degree; while injections of the same quantity of vaselin (an inert body) decreased the exchange of nitrogen. 2. The exchange becomes qualitatively more perfect. 3. The assimilation of nitrogen is slightly decreased in these patients. 4. In roseola the exchange, previously much elevated, is somewhat lowered, while assimilation is increased. The exchange becomes more perfect from a qualitative point of view.

Methylene Blue.—See Aniline Dyes.

Morphine.—See Opium.

Morrenia Brachystephana.—E. del Arca and J. Sicardi⁵⁰³_{Mar. 5} recommend this plant as a galactagogue. In 15 cases of lacteal suppression, in women aged from 20 to 40 years, 3 primiparæ and 2 multiparæ, satisfactory results were obtained in 11 cases, doubt-

ful results in 2 cases, and negative results in 2. The length of time which had elapsed between the labor and the beginning of the treatment seemed to have had no influence on the result. The authors prescribed either the fluid extract of the fresh or dried root (30 per 200 grammes—1 to $6\frac{1}{2}$ ounces—of water), or a decoction of the fruit (40 per 200 grammes— $1\frac{1}{4}$ to $6\frac{1}{2}$ ounces—of water), to be taken in dessertspoonful doses every twenty-four hours. The only objection to the drug is its nauseating, bitter, and disagreeable taste.

Muira Puama.—H. Kleesattel ⁵⁸⁶_{No.18} publishes an article upon this plant, a native of Brazil, as yet but little known. As far as studied, it seems to contain no alkaloids, but tannin, starch, and oxalate of lime. The natives regard it as an aphrodisiac. According to Goll the watery and alcoholic extracts are slightly tonic, increase the excitability of the brain and spinal cord, and are free from all danger. The author has used the fluid extract for three years in patients suffering from nervous impotence. This being a secondary affection, however, the original disease should be sought for and nothing else; otherwise much harm may be done the patients.

Myrrh.—Ströll ²⁹⁷_{Apr.15} heartily recommends tincture of myrrh in the treatment of diphtheria, as proposed by Hoadley. Twenty cases treated by him ended in complete recovery. The dose is diminished as the condition of the patient improves. One point must be insisted upon in this treatment, and that is that the medicine be administered even during the night. Local treatment accelerates recovery. The physician should make applications of the pure tincture of myrrh to the throat every hour where the pharynx is involved. If the case be one of laryngeal diphtheria, the patient should be made to inhale every hour, or every half-hour if necessary, from 1 to 2 dessertspoonfuls of a mixture of myrrh, 2 to 100. The prolonged use of the remedy for several days causes effervescence of the urine, and it is necessary to suspend it for a certain time as soon as a frequent desire to urinate becomes apparent.

Myrrholine.—This is prepared ⁵⁵⁶_{Apr.16} by dissolving myrrh in an equal quantity (by weight) of oil. It is of value in tuberculous laryngitis, prescribed in capsules containing each 0.20 gramme (3 minims) of myrrholine and creasote 0.30 gramme ($4\frac{1}{2}$ minims);

or in local applications in the form of an ointment, containing myrrholine 1 part, vaselin 9 parts. This favorably influences eczema of the nares in a short time.

Naphthol Hydrate.—See Bismuth.

Narceine.—Laborde, of Paris, ⁵²⁷_{Mar. 6} contributes a note on meconarceine, which he, with Duquesnel, has thus designated in order to show that it is not a definite chemical product. It contains, however, true crystallized narceine, and produced the same physiological effects as those observed by Claude Bernard. In spite of its relative insolubility it may be kept, by heating, in an aqueous solution long enough to permit of experiments on animals. It is only in experiments on man that its want of solubility becomes an obstacle. Adrian, in the discussion following the reading of this paper, recalls the formula given by Patrouillard to obtain an efficacious syrup of narceine :—

R Narceine,	0.25 gramme (4 grains).
Benzoate of soda,	0.40 gramme (6 grains).
Simple syrup,	500.00 grammes (1 pint).

In order to obtain a perfect solution this should be previously triturated in a mortar and carefully mixed. Bocquillon, of Paris, ⁵²⁷_{Feb. 22} proposes the following new formula for the dissolution of narceine :—

R Narceine,	0.20 gramme ($3\frac{1}{4}$ grains).
Salicylate of soda,	2.50 grammes (38 $\frac{3}{4}$ grains).
Distilled water,	10.00 grammes ($2\frac{1}{2}$ drachms).

Constantin Paul, in the discussion, said that if there existed soluble salts of narceine it was preferable to use them, as the danger of changing the nature of the drug was avoided. Bocquillon replied that the combination was necessary, inasmuch as no directly soluble narceine was known. The hydrochlorate, which is a definite salt, well crystallized, dissolves only in the proportion of 1 per cent.

Nerium Oleander.—This drug, ³⁷⁸_{Apr. 20} ¹⁵¹_{June} like digitalis, acts rapidly and manifests itself over a long period by the evenness, slowness, and force of the pulse, slowing of respiration, more abundant diuresis, more frequent and easier bowel evacuations, and the disappearance of palpitation, œdema, and dyspnœa. It is indicated in all conditions where digitalis is tried and found wanting. Causing free intestinal action without affecting vascular tension, it is useful

in both young and old subjects affected with cardiac and renal affections complicated by palpitation, œdema, dyspnœa, affections of the myocardium, and atheromatous degeneration of the arteries. It is contra-indicated if there is any diarrhœa or vomiting. The preferable preparation is the tincture from the unripe fruit, or the infusion. The dose of the tincture is 20 or 30 drops every two or three hours, or from 0.10 to 0.20 gramme ($1\frac{1}{2}$ to 3 grains) daily of the powdered leaves.

Niaouli.—G. Bertrand, of Paris, ⁶⁷_{May 16} has studied chemically the essence of niaouli, a tree of the family of Myrtaceæ, of New Caledonia. The essence contains fatty volatile acids, especially valerianic acid, a phenol body allied to salicylated methyl, a sulphuric product and ethers of terpinol (valerianic ether); benzoic aldehyde in small quantity (0.2 per cent.). The principal constituents are (1) turpentine ($G_{10}H_{16}$), dextrogyrous; (2) eucalyptol ($G_{10}H_{18}O$), inactive, the most important substance comprising two-thirds of the weight of the essence; (3) citrine ($G_{10}H_{16}$), levogyrous; (4) terpinol ($C_{10}H_{18}O$), also levogyrous. The wood of the tree exhales a strong, disagreeable odor, and the leaves purify the stagnant water into which they fall; fever is unknown in the regions in which it grows. The essence of niaouli is identical or very nearly allied to essence of eucalyptus, the hygienic properties attributed to it in New Caledonia being the same as the *Eucalyptus globulus*. The medicinal properties of the essence and its therapeutic indications are the same.

Nitroglycerin.—R. Humphreys ²_{Apr. 1} recommends nitroglycerin in vomiting of whatever nature or origin. An experience of three years has shown him that it acts rapidly and almost like a specific in catarrh of the stomach in adults and infants, in alcoholics and anæmics. He has obtained good results in case of incoercible vomiting of pregnancy, also in vomiting of cerebral origin, and in one case of lenteric diarrhœa. It is of little value in the vomiting of phthisis, and in peritonitis it even increases vomiting. No untoward symptoms were observed from its use.

Nucleine.—Germain Sée, of Paris, ¹⁰_{May 9} has given this name to a substance extracted from the cells of the spleen and from various other organs. It is a phosphorylated proteine, thus distinguishable from other albuminoid substances. It is a light-yellow-colored powder, insoluble in water and in alcohol, but soluble in alkaline

solutions. According to the author, the injection of a solution containing 2 or 3 grammes (30 to 45 grains) of this substance will augment the number of white globules acting as phagocytes. Séé has mentioned, in particular, the good effects obtained by the use of nucleine in certain cases of pneumonia and of pleurisy.

Opium.—H. Hager⁹⁵³_{No. 32} calls attention to the fact that opium and morphine, in solution, when subjected to a temperature of from 95° to 100° C. (203° to 212° F.), lose a considerable portion of their narcotic power; the author therefore gives the name of “mitigated opium” to these preparations. Heat doubtless transforms the active substances into derivatives which are much less powerful. These mitigated preparations may be administered to children and women, as well as to debilitated persons, without the least danger. The process for preparing mitigated opium is as follows: 20 grammes (5 drachms) of powdered opium and 30 grammes (1 ounce) of distilled water are placed in a porcelain vessel. The temperature is raised by means of a water-bath to 95° or 100° C. (203° or 212° F.), while constantly stirring the preparation. It is allowed to evaporate to desiccation and to cool off, after which it is reduced to a powder, which must be kept from contact with the air, in an hermetically-closed bottle. The same preparation can be made with this powder as with ordinary opium, using it in the same manner as the latter. This action of heat upon opium having been demonstrated, it should be pharmaceutically admitted that, in the preparation of the ordinary extract of opium, the temperature of evaporation or of desiccation should never exceed 50° C. (122° F.) in the open air. By neglecting this precaution, the narcotic power of opium or of morphine becomes considerably diminished.

Lamal, of Antwerp,⁵²_{Mar. 25} refers to the mobility of these organic substances as regards their chemical composition, and shows, with Dragendorff, that certain opium alkaloids are strongly resistant to the action of ferments. He demonstrates by experiment the great resistance of narceine, one of the most complex of the alkaloids, and which should be the most alterable. Nevertheless, it is shown by this experiment that these organic bases are not completely indifferent to organic ferments; that while incapable of fermentation they may, nevertheless, permit the life and often rapid development of micro-organisms which would cause them to undergo more

or less profound alteration. This was especially shown as regards morphine in experiments upon the sulphate of this base.

Condamin, of Lyons, ²¹¹_{Mar.12} proposes a new method of administering morphine, with which he has experimented for several years. Instead of injecting a Pravaz syringe of the usual solution hypodermatically, the contents of the syringe are injected into the rectum by means of a special cannula. From 1 to 5 cubic centimetres ($15\frac{1}{2}$ minims to $1\frac{1}{4}$ drachms) of liquid may thus be introduced into the rectum, representing 0.10 gramme ($1\frac{3}{4}$ grains) of morphine. So small a quantity of liquid will always be well tolerated, penetrates into the rectal ampulla, and is absorbed very rapidly—from four to ten minutes; not much longer than by the hypodermatic method. He claims the following advantages for the method: There are no accidents such as may follow improper subcutaneous injections, such as induration, abscess, etc.; on account of the great tolerance of the rectum, the medication may be continued for a long time, and the patient, who generally dreads the hypodermatic injection, can himself make this injection, which is entirely painless. If the special cannula devised by Condamin be not available, a small rubber catheter can be adapted to the Pravaz syringe.

F. Flechsig ⁶⁹_{No.21} recommends the following treatment of epilepsy: Extract of opium 0.05 gramme ($\frac{7}{8}$ grain) two or three times daily, gradually increasing the dose to 1 gramme (15 grains) and more. After six weeks, the opium is suddenly discontinued and immediately replaced by bromine in large doses (as much as 7.50 grammes— $1\frac{3}{4}$ drachms) daily. After two months the dose is gradually diminished until only 2 grammes ($\frac{1}{2}$ drachm) daily is given.

T. and H. Smith ⁷⁴⁴ have succeeded in isolating a new alkaloid of opium, to which they have given the name of xanthaline, and the formula of which is $C_{37}H_{36}N_2O_9$, as determined by Ost, of Hanover. The authors discovered xanthaline twelve years ago, but, having been able to obtain it only in very small proportion, it was not possible to study its properties. It is met with in the acid "mother" of the crystallization of hydrochlorate of morphine and codeine; it is precipitated by neutralizing the liquors with narcotine, papaverine, and a certain number of impure substances. It is so weak a base that if one of its salts be treated by water

the acid separates, leaving the base in a free state, as with caffeine. Xanthaline consists of thin, white crystals; its salts have always a beautiful yellow color; the nitrate has a golden yellow or orange shade; the hydrochlorate and sulphate are a little paler. They form in acicular crystals of larger size than those formed by the base itself. If nascent hydrogen be combined with xanthaline, a new base is formed, hydroxanthaline ($C_{37}H_{38}N_2O_9$), the sulphates of which are in the form of white, anhydrous crystals.

Orexin.—Penzoldt¹¹⁶_{May} reviews two hundred and seventy-three cases treated by orexin, and gives the following indications, contra-indications, and mode of administration of the drug: 1. By the use of basic orexin the burning sensation in the œsophagus and the vomiting may be almost completely prevented by taking certain precautions. The value of basic orexin, as a stomachic, is at least equal, if not superior to, that of the hydrochlorate of orexin. 2. The indications for the use of the former are: (a) in chloranæmia; (b) in functional neuroses, as hysteria, neurasthenia, etc.; (c) in pulmonary tuberculosis in the early stage, or in chronic conditions; (d) in gastric affections, such as atony, dyspepsia, moderate catarrh; (e) in circulatory or respiratory lesions of moderate severity, as valvular lesions, muscular insufficiency of the heart, emphysema, etc. 3. The results are not satisfactory or entirely negative in pulmonary tuberculosis in the last stage, in advanced pulmonary or cardiac affections, in febrile processes, and in grave gastric troubles, as cancer and obstinate catarrhs. 4. It should be administered with caution, beginning with very small doses, in serious renal affections or in cases in which the gastric mucous membrane is very sensitive. 5. Orexin is absolutely contra-indicated in ulcer of the stomach and the excess of hydrochloric acid so often accompanying it, and in all cases in which vomiting is to be avoided, as in hæmorrhage after operations upon the eyes, abdomen, etc. 6. It should be given finely powdered, in wafers or capsules, swallowed rapidly, and about a pint of lukewarm liquid taken immediately, such as milk or bouillon. It is preferably administered about 10 A.M. 7. The average dose for adults is 0.3 gramme ($4\frac{1}{2}$ grains) once daily. If it is necessary to act with caution, trial doses of 0.1 to 0.2 gramme ($1\frac{3}{4}$ to 3 grains) should be given at first. If doses of 0.3 gramme ($4\frac{1}{2}$ grains) are well supported without producing a favorable effect, 0.4 to 0.5 gramme (6 to $7\frac{3}{4}$ grains) may be given.

If the desired effect be produced after a single dose, or after repeated doses on consecutive days, the medicament should be suppressed to ascertain if the effect persist. If at the end of eight or ten days the drug produce no effect, it should be discontinued and repeated in eight days if necessary. In most cases the effect persists for five or ten days after basic orexin has been administered about five days.

Ortho-amido-salicylic Acid.—This is a grayish-white amorphous powder, almost inodorous, slightly sweet, of a not disagreeable taste, and insoluble in water, alcohol, and ether. Neisser ⁸¹⁴_{Feb.} has employed it with success in a case of subacute articular rheumatism.

Oxygenated Water.—Samuel S. Wallian ¹_{Nov. 26, '92} has made a long study of the therapeutic uses of oxygenated water (hydrogen dioxide). After giving in detail the preparation and chemical properties of the substance, he states that its chief value is as a germicide, owing this quality to the great quantity of oxygen which it sets at liberty; if to this be added the fact that it is not toxic nor corrosive, it is easily seen that it must be a precious agent in therapeutics. It cleanses and disinfects ulcers rapidly; it is of service as an application or spray in amygdalitis, angina, laryngitis and diphtheria. It gives brilliant results in conjunctivitis, ophthalmia, blennorrhagic leucorrhœa, and even in all sorts of suppuration. Administered internally, it has been of benefit in diabetes, in many cases causing the sugar to diminish and disappear from the urine. Another of its uses is in antiseptis of the stomach, in flatulent dyspepsia or gastric catarrh. Good results are also obtained from its use in internal hæmorrhage, as a potion in hæmatemesis from ulcer or cancer of the stomach, and in the form of vapor in pulmonary hæmorrhage. In rectal or uterine cancer it acts as an excellent disinfectant, and calms the pain while cleansing the parts. Richardson has utilized it as a source of oxygen in cardiac or pulmonary dyspnœa, and recommends the combination of oxygenated water with ether for anæsthesia, in such a way that the patient will receive sufficient oxygen to prevent asphyxia. The only inconvenience in the use of this agent, according to Wallian, is in the irregularity of the quality as furnished by the trade. He gives the necessary qualities of well-prepared hydrogen dioxide and the means of testing it.

Paraldehyde.—In twelve cases of spasmodic asthma, some of

which had been submitted to the usual treatments, William Mackie ²_{Jan.14} succeeded in causing the disappearance of the spasm in a short time by the administration of paraldehyde, in doses of 2 grammes ($\frac{1}{2}$ drachm), repeated every half-hour until the effect was produced. The author was never obliged to give more than three doses; often only one dose sufficed. In a boy of 13 years, affected with asthma from infancy, relief was obtained after a dose of 20 drops. Ordinarily sleep follows immediately after the cessation of the spasm. Humphrey ²_{Apr.8} considers paraldehyde as the only remedy of value in Cheyne-Stokes respiration. He observed two cases of broncho-pneumonia following influenza, with Cheyne-Stokes respiration, which were cured by its use. In one of these the symptom was accompanied by acute delirium and lasted several weeks.

William D. Granger, of Mount Vernon, N. Y., ¹_{Dec.10,'92} reports a case of insanity in which very large doses of paraldehyde were administered, often as much as 10 drachms (39 grammes) during the night. No bad effects followed. Peterson, of New York, ¹_{Dec.10,'92} observed a case of paraldehyde habit in which the woman had taken 1-ounce (30 grammes) doses nightly for months, and, instead of suffering ill effects, had grown fat. Charles L. Dana, at the same society, stated that he had seen bad effects from 2-drachm (8 grammes) doses taken for the first time, and therefore advised beginning with only 1 drachm (4 grammes) at a dose.

Pental.—Kleindienst ¹¹³_{Feb.12} has found that patients anæsthetized by means of pental present albumen in the urine for some time afterward. In 12 cases albumen was present in 8; and in 3 cases there was, besides, hæmoglobin in the urine.

Philipp ¹⁶⁹_{Jan.} reports the history of 200 cases of narcosis by pental among children. The operations lasted an hour and even longer. Pental exercises no bad influence on the action of the heart, and the secondary accidents following the administration of chloroform are not observed. The author made use of the mask proposed by Hiller for narcosis by bromide of ethyl. Sleep followed without excitement, and in one case only was cyanosis noted. The awakening was gradual, but ordinarily required several minutes after the removal of the mask. Nausea, vomiting, and vertigo were not observed. It is altogether unnecessary to prepare the children beforehand for this narcosis, and some children may be put under its influence immediately after a meal without any bad effects. On

account of the absence of all toxic symptoms the author advises the use of pental as a local anæsthetic instead of cocaine.

C. G. Velez ⁶³²_{Feb.7} has made use of pental in 108 cases (mostly in dental surgery), with satisfactory results; 0.15 gramme ($\frac{4}{5}$ grain) poured upon a mask filled with crude wool induced sleep in one minute. In several cases in which it was necessary to keep the subject under anæsthesia for a considerable time, he was allowed to become conscious and again submitted to the action of pental, sleep then coming on in half a minute. One man of 38 years was thus submitted to anæsthesia three times within thirty minutes, and two hours later was able to walk home. As to secondary effects, nothing disagreeable was observed in his case except somnolence for the balance of the day. The principal advantage of pental consists in the fact that tolerance is not established, but the effect seems to increase with each application. As a general rule, consciousness is not completely lost, but sometimes the anæsthesia is absolute. The sleep is tranquil; the face retains its natural color; the eyes are open and the regard fixed; the pulse accelerates in the beginning, but returns to normal in several seconds. Awakening is quiet, and there are no bad after-effects. Patients take the drug several times without manifesting any repugnance. The author is of the opinion that pental will replace chloroform and ether with advantage in operations of short duration. It is inflammable, and should never be employed at night.

R. Friedländer, of Berlin, ^{116 166}_{Jan.; July} calls attention to certain untoward effects observed in the use of pental, one death being reported from Vienna. Cases reported by Holländer, Breuer, and Lindner indicate marked depression of the heart's action or of the respiration as of occasional occurrence.

P. F. Féodoroff ⁵⁸⁶_{Nos.3,4} has experimented with pental in general surgical anæsthesia. This very stable substance does not become decomposed either in light or air; its specific gravity is about that of ether, and, like the latter, it is very volatile. Care must be taken to keep this substance removed from the fire; it burns with a very bright flame, but it has no explosive properties. The vapor of pental does not irritate the mucous membrane. According to Féodoroff, the duration of pentalization is from one to two minutes, and, the condition of anæsthesia once induced, it may be prolonged from two to five minutes. In about 50 per cent. of the cases the

radial pulse is not modified, but otherwise the pulsations become more frequent, and sometimes there is arrhythmia. It is principally during the first minute that disturbances of the circulation show themselves; it is, therefore, very necessary to be circumspect during the primary inhalations, and not to have recourse to the concentrated vapor of pental, except after the first minute, when the action of the heart will already be regularized. It is important to call attention to two peculiar effects of the drug: 1. Analgesia occurs while consciousness is still retained; the patient executes all the orders of the physician, feels the contact of the instrument, but does not feel pain. It would, however, be imprudent to operate before the complete loss of consciousness; the majority of accidents which have happened during the use of pental were due to reflexes occurring in subjects insufficiently anæsthetized. 2. From ten to fifteen minutes after a first administration of the drug it may again be used without its action being weakened; it would even appear that the subjects are still more susceptible to its effect. One must also be careful never to operate with the patient in a sitting posture, but always in the recumbent position, for fear of dangerous accidents. To resume: Pental is an excellent anæsthetic in operations of short duration.

Petroleum.—Brunon²⁰³_{July} has published several cases of grave diphtheria treated with success by petroleum. In one of these cases, however, he observed during convalescence an eruption which he attributed to the absorption of the petroleum. The patient was a young man of 19 years, suffering from a grave form of diphtheria, which improved rapidly under treatment by petroleum, the temperature falling to normal. The eruption appeared on the fifth day of the treatment, when the patient was convalescent. There were slight general symptoms, such as lassitude and transitory fever. Plaques resembling roseola were generalized over the body, being papulous on the members, rose-colored on the elbows and knees, and purplish in the other portions of the body. The dorsal and palmar surfaces of the hands and the plantar surfaces of the feet were affected with pruritus. Furfuraceous desquamation of the face and neck occurred on the ninth day. The plaques were still quite distinct on the trunk and extremities, and persisted for twelve days. The general condition of the patient was excellent.

Adrian and Bardet, of Paris, ²⁹⁶_{July 8} alluding to the use of petroleum in diphtheria (Flahaut ²⁰³_{Mar.}) and in conjunctivitis, have reached the following conclusions: (1) that there is no advantage in the use of raw petroleum in therapeutics; (2) in default of special indications, the American petroleum, known under the name of kerosene, boiling at from 150° to 180° C. (334° to 388° F.), should be given for internal use; (3) the medicinal petroleum delivered by the pharmacist should be rectified with the greatest care, in the usual manner; (4) if experience shows the advisability of using petroleum charged with heavy oils, it would be well to obtain a composite petroleum possessing the quality of a truly pharmaceutical purification.

Phediuretin.—This derivative of phenol occurs in the form of tiny, white crystals, insipid in taste, little soluble in cold water, but more freely soluble in hot water. Its chemical constitution has not yet been exactly determined. Experiments upon animals made by the author, J. Orient, of Csetnek, Hungary, ¹¹⁴⁸_{p.192} show that the substance dissolves readily in the stomach and soon enters the blood. Given in large doses it acts upon the central nervous system and causes abundant diuresis. Besides this action, it exerts a favorable influence on migraine, in doses of 0.5 gramme ($7\frac{1}{2}$ grains) twice a day.

Phenacetin.—M. H. Lee, of Knoxville, ⁷⁴_{Oct., '92} reports four cases of syphilitic and other ulcerations, which had proved rebellious to all other treatment, but which yielded rapidly to the local use of phenacetin. The mode of application is very simple, the phenacetin, finely powdered, being applied to the ulcerations. It acts as an analgesic, antiseptic, and stimulant. The author believes that acetanilid would act in the same way. It is needless to say that in specific ulceration an appropriate general treatment should be combined with the phenacetin.

Phenocoll.—Kucharjewski ⁵⁸⁶_{No.44,'92} has experimented with hydrochlorate of phenocoll in 15 cases,—3 of phthisis, 1 of typhoid fever, 1 of erysipelas, 2 of sciatica, 1 of hepatic colic, 1 of chronic myelitis, 1 of facial neuralgia, and 5 cases of articular rheumatism. He arrived at the following conclusions: 1. It is a certain antipyretic, even in fractional doses of 0.50 to 0.06 gramme ($7\frac{1}{2}$ grains to 1 grain) every two hours. 2. In similar doses it is also, in certain cases, an excellent analgesic, diminishing and dispelling

the pain of neuralgia. 3. In 3 cases of chronic rheumatism phenocoll brought about a rapid return to the normal condition; in 1 case of acute articular rheumatism it dispelled the fever, but had no influence on the pathological process. 4. The drug cannot be used hypodermatically, as it is but slightly soluble in water. 5. No untoward symptoms were observed from its use, even in doses of 3 grammes (46 grains) every twenty-four hours. The urine was often very dark, but it never gave the reaction of Hertl.

Bonetti¹¹⁴⁷_{p.175} publishes a study of the antimalarial action of phenocoll hydrochlorate. He administered from 2 to 6 grammes ($\frac{1}{2}$ to $1\frac{1}{2}$ drachms) during the entire period of treatment, giving 1 gramme ($15\frac{1}{2}$ grains) twice in an interval of two hours, and always before the paroxysm. In 42 trials he obtained 21 positive results,—15 negative and 6 uncertain. He regards the remedy as a powerful one in malaria, and as a real substitute for quinine. It seems to be indicated in chronic cases of intermittent fever, of long duration. Cervello⁵⁰⁵_{Jan.21} made use of phenocoll in eighteen cases. In most of these fever disappeared after the first or second dose; more rarely it fell gradually, only completely disappearing on the fifth or sixth day. In only three cases was it shown to be less efficacious than quinine, and then but small doses of the drug were employed. The author usually prescribes from 1 to 2 grammes ($15\frac{1}{2}$ to 31 grains) two or three times, to be taken from two to four hours before the expected paroxysm. There are no secondary effects, quinine being inferior in this respect. Phenocoll, mixed with sugar, is especially indicated for children who take quinine badly. Pallettini⁵⁰⁵_{Jan.14} has prescribed the drug in one hundred cases of intermittent fever rebellious to quinine. In 50 per cent. of the cases there was a cessation of the fever and no disagreeable after-effects. He regards it as superior to all other remedies proposed for malaria.

Mangano⁵⁸⁹_{Jan.27} has experimented with this substance and shows its absolute impotency in some cases of intermittent fever, *i.e.*, where the semilunar organisms of Laveran are found in the blood. It is true that in these cases quinine also fails; but even in cases where other parasites (*hæmamoeba malaris*, *hæmamoeba virax*) are found in the blood, yielding often to a great number of drugs and often improving spontaneously, the author failed completely with phenocoll.

G. Cucco¹¹⁶_{Apr.} has successfully used hydrochlorate of phenocoll in malaria. He prescribes this drug in doses of from 1 to 1.5 grammes (4 to 6 drachms) per day, in capsules of 0.5 gramme ($7\frac{1}{2}$ grains), to be taken during seven consecutive days, and beginning the treatment about twelve hours before the expected onset of the attacks. In this way one is sure of breaking the fever. Usually, there are no untoward secondary symptoms. The taste of the phenocoll is much more easily disguised than that of sulphate of quinine, and children take it readily. The drug may also be administered without inconvenience to patients suffering from irritation of the digestive canal. Among 87 cases treated, 52 proved successful, 21 doubtful, and 7 were failures. The remaining 7 cases were still too recent, at the time of publication, to admit of classification. Several patients, who at first showed symptoms of intoxication by quinine, were able to support the phenocoll, and were cured. In certain cases the association of phenocoll and quinine resulted in curing the fever, when the two remedies given separately produced no effect. On the whole, the author recommends the hydrochlorate of phenocoll as a good succedant of quinine in the treatment of intermittent fever.

Phenosalyl.—Duloroy, of Paris,²⁰¹² has studied this new antiseptic, recently proposed by J. de Christmas, of Paris, as to its bactericidal powers and its uses in surgery and gynaecology. Phenosalyl is composed of carbolic acid, 9 parts; salicylic acid, 1 part; lactic acid, 2 parts; menthol, 0.10, and essence of eucalyptus, 0.50. The three acids are heated to liquefaction, the menthol added, and then the essence of eucalyptus. It is a colorless, aromatic liquid, soluble in water in the proportion of 7 per cent., and in glycerin and alcohol in all proportions. The experiment of Duloroy showed that phenosalyl possesses antiseptic powers superior to those usually employed, with the exception of corrosive sublimate. A solution of 1 per cent. suffices to kill the most resisting microbes in one minute. It has the great advantage of being non-toxic, the experiments showing it to be four times less so than carbolic acid and a hundred times less than corrosive sublimate. Its use in gynaecology and, above all, in obstetrics, seems, therefore, to be indicated, since the antiseptics generally employed are either insufficient or expose the patient to the danger of poisoning. Clinical experiments with the drug were made at the Hôtel-

Dieu, in Paris, in the service of Cornil, upon more than one hundred patients, mostly affected with genito-urinary troubles, as endometritis, erosions of the cervix, vaginitis, and urethritis. In every case, even inveterate ones, its use was followed by rapid recovery. In several cases of puerperal infection it caused the fever and other symptoms rapidly to disappear. For surgical use, injections, irrigations, etc., phenosalyl is employed in aqueous solutions of from $\frac{1}{2}$ to 1 per cent. This does not injure the instruments nor irritate the skin. It may easily be used for antiseptic gauze and cotton, and for the preservation of silk and hair, sponges, etc.

Roskam, of Liège ²⁹³_{Mar.} has used phenosalyl in two cases of purulent cystitis, twelve cases of blennorrhagia, and two cases of impetiginous eczema of the scalp and of the face in children. In treating cystitis the author proceeded in the following manner: Injection of 200 grammes ($6\frac{1}{2}$ ounces) of a warm 10-per-cent. solution of borax, evacuation by means of the catheter, then injection of the warm solution of phenosalyl, evacuation by the catheter after one minute; following this another injection of the disinfectant solution. The catheter is withdrawn, and the liquid injected is retained by the patient for several minutes, and is then evacuated naturally. The solution made use of is as follows: 60 grammes (2 ounces) of phenosalyl in 1 litre (quart) of water (strong solution). The pains occasioned by these injections are relatively slight, and only last a few minutes, if care is taken to immediately give a hot bath. In order to cure these two serious cases of cystitis, which had resisted all the usual treatment, only two *séances* like that above described were necessary in the one case, while in the other four sittings were required, made at intervals of twenty-four hours. At the end of four months the recovery was still permanent. In the cases of blennorrhagia the results were not very good; at least, the phenosalyl did not in these cases seem superior to other well-known antiseptics, particularly the permanganate of potash. The two cases of impetiginous eczema were very severe. After having softened the crusts as much as possible with warm water, in order to detach all that could be removed, compresses saturated with the weak solution of phenosalyl (3 per cent.) were applied; the compresses were removed every six hours. The recovery was radical after two days, and it was only necessary to

cover the affected parts for four days with a mixture of benzoated ointment and lanolin. Fraipont²⁹³_{Mar.} experimented particularly with this drug in obstetrics and gynæcology and obtained good results. In sixty-eight confinement cases (among which were one of version, three forceps, four artificial delivery, three embryotomy) he only noted fever in three cases. No deaths occurred. In obstetric practice the author uses a weak solution of phenosalyl,—that is to say, 30 grammes (1 ounce) in a litre (quart) of distilled water; in gynæcology he uses the strong solution, which is twice as concentrated. In one hundred operations only one death occurred; the patient had metritis, complicated with salpingitis. In endometritis he used phenosalyl crayons after the curettage.

Pichi.—Friedländer¹¹⁶_{July} gives the result of his researches with pichi in diseases of the urinary passages, after recalling that in South America the use of this plant (*Fabiana imbricata*) in the treatment of such diseases is frequent. In Germany a fluid extract is used, which is a dark-brown liquid of an agreeable odor, with a decidedly bitter taste and a pleasant aroma. In doses of 1 to 20 grammes (15½ grains to 5 drachms), this extract excites the appetite and diminishes the desire to urinate, the urine retaining the odor of the extract. The author has treated with this remedy patients suffering from diseases of the urinary passages, such as cystitis, prostatitis, acute gonorrhœa, and epididymitis. During three consecutive days each patient took the equivalent of one teaspoonful of the fluid extract, either pure or with a little sugar. None complained of the taste of the drug, and none showed digestive or renal disturbances, or cutaneous eruptions. The results were very satisfactory, principally in cases where the urinary passages were the seat of very abundant purulent secretions. At the same time the remedy exercised, by its bitter and aromatic quality, a salutary influence on the digestive organs.

P. Rogay,²⁰²_{No.2} in eleven cases of lesions of the urinary passages (cystitis, hypertrophy of the prostate, frequent micturition, and painful urination), has used with success the fluid extract of pichi in doses of 10 to 20 drops every three or four hours. In ten cases recovery ensued after twenty-four to sixty doses. In only one case was he obliged to administer the medicine for twenty consecutive days. The sooner the treatment is commenced, the sooner its action is manifested.

Picrol.—This is an iodized derivative of resorcin monosulphonic acid, ⁵⁶²_{Jan.1} obtained by the addition of an aqueous solution of 5 molecules of monosulphate of potassium, with an alcoholic solution of 8 atoms of iodine and 2 molecules of hydriodic acid. The solution is shaken energetically until it becomes colorless; the alcohol is then carefully evaporated, and the aqueous solution is heated to the point of evaporation and crystallization. The salt of potassium of this iodized composition appears in the form of a crystalline powder, inodorous, colorless, with a bitter taste, with acid reaction, soluble in five parts of water, the same in glycerin, alcohol, ether, chloroform, and the alkalis. *Picrol* contains 55 per cent. of iodine, and is a very energetic antiseptic.

Pills.—Morner ³⁷²_{Nos.2,3} ⁶⁷³_{June} states that pills should retain their consistence in order to produce the proper effect. The practice of dispensing them in pasteboard boxes is the cause of their drying and hardening, even after the lapse of a few days, and, consequently, the intended effect—resorptive or local—is less in degree and considerably more retarded; it is possible that a greater or less part of the active principle will be lost through the improper consistence of the pills, and the latter will pass out in the faecal matter without producing their effect. For this reason all pill-boxes should be discarded, and glass bottles substituted for them. Carles, of Bordeaux, ¹⁸⁸_{Apr.14} proposes a new excipient for pills, to be used for certain drugs, such as permanganate of potassium, capable of rapid alteration with ordinary excipients. It is: kaolin, 2 parts; mixed with anhydrous sulphate of soda (obtained by calcination of crystallized sulphate of soda at red heat), 1 part; water, 1 part at the most. This makes a plastic mass which becomes very hard in the course of a quarter of an hour. Into this purely-mineral excipient may be introduced, in the form of powder, permanganate of potassium, nitrate of silver, chloride of gold, iodide of mercury, etc. The pills preserve their active principle indefinitely, and dissolve in water in the space of one minute, leaving the chemical salt in all its purity. It cannot, however, be used with baryta salts, lead, or lime.

Piperazin.—Rörig ¹¹⁶_{Mar.} prescribed piperazin in doses of 1 gramme ($15\frac{1}{2}$ grains) daily, and on the second day found a considerable quantity of albumen in the urine. Of the two patients, one was suffering from nephritis and the other from renal calculus. His

experience proves that in certain cases piperazin provokes or augments the albuminuria, and that it is therefore necessary to observe carefully the cases in which it is administered. Wittsack^{826 Aug.} states that in the uric-acid diathesis piperazin must be administered continuously for a fortnight (15 grains—1 gramme), at least, before an opinion can be formed: 1. Diuresis is considerably increased, the urine passed in a case of arthritis having been doubled. 2. Specific gravity of the urine lowered, but it never becomes alkaline or even neutral. 3. The appetite is not affected, and no disturbance of the general condition has been observed. He considers the hydrochloric salt of piperazin better than free base-product, being less hygroscopic. Subcutaneously, piperazin is painful and dangerous, causing infiltration, with tendency to abscess. Piperazin has been much recommended for the treatment of gout, as well as of uric-acid gravel. Levison²⁰⁸⁹ tried it in some cases, and found that it acted only as an organic base by which the urine may be rendered alkaline, while it had no special power of dissolving uric acid or influencing its secretion.

Polygonum Aviculare.—A. V. Trapeznikoff^{582 No. 22} praises this plant, recommended by Leurat-Peretton, in diarrhœa. Legoy prescribed it in the premonitory diarrhœa of cholera. The author used the drug in 22 cases, succeeding in 19 cases. In one of the failures all other treatments were of no avail, including subnitrate of bismuth, opium, etc. Trapeznikoff used an infusion containing 30 grammes (1 ounce) of *polygonum aviculare* in 120 grammes (4 fluidounces) of distilled water, to be taken in twenty-four hours, in tablespoonful doses. Ordinarily the diarrhœa was arrested in three days. Some patients took four or five bottles of the infusion.

Potassium.—F. Hunt^{113 No. 17} considers *bichromate of potassium* an excellent expectorant for children, and has used it with success in capillary bronchitis, in doses of 0.003 gramme ($\frac{1}{2}$ grain) mixed with sugar. The dose for a child of 1 year is 0.015 gramme ($\frac{1}{4}$ grain).

Sokaki^{953 No. 2} states that *tartrate of potassium*, in doses of 10 to 20 grammes ($2\frac{1}{2}$ to 5 drachms) a day, is an excellent remedy in ascites due to stasis. From experience in twelve cases, he thinks that the most effective dose is that which causes a movement of the bowels two or three times a day. Although it may sometimes

be ineffectual at the beginning of the disease, it acts in the more advanced stage. The following is the best formula: Pure cream of tartar, 20 grammes (5 drachms); distilled water, 200 grammes ($6\frac{1}{2}$ ounces); oleosaccharate of lemon, 8 grammes (2 drachms); the mixture to be well shaken before use.

Tommasoli and Vinci²⁸_{p.427, '92} used *dithiocarbonate of potassium* with success in the treatment of various cutaneous affections, either as ointment or in watery solution. The substance (K_2COS_2) is prepared by pouring boiling sulphide of carbon upon caustic potash. It is an orange-red, crystalline powder, very soluble in water, slightly soluble in alcohol, and deliquescent in air. By the addition of any diluted acid, sulphuretted hydrogen, carbonic acid, and oxisulphide of carbon, as well as a precipitate of sulphur, are formed. Preparations containing as much as 5 per cent. of dithiocarbonate are well tolerated, while more concentrated preparations sometimes cause untoward symptoms. The authors are of entirely the same opinion as Unna, that sulphuric preparations are not active in themselves, but owe their efficacy to the sulphuretted hydrogen formed when they are brought in contact with organic tissues.

Purgatives.—Kohlstock¹¹⁶_{Jan.} has endeavored to introduce the subcutaneous injection of the four following purgatives: aloin, cathartic acid (Seuë), pure colocynthin, and pure citrullin. The purgative effects were very pronounced, but the pain caused by the injections was so intense that the patients refused absolutely to permit their repetition. Even the addition of cocaine did not render them more supportable. The author then tried injection by the rectum with the greatest success. He used a glass syringe containing 10 cubic centimetres ($2\frac{1}{2}$ drachms). There was no irritation, and therefore no tenesmus, as frequently observed after injections of glycerin. If colic supervened, it was not severe and occurred only twenty minutes after the injection. The dejections were very profuse. The employment of these injections was followed by no tendency to constipation and no secondary effects of any kind. The principal inconvenience is the high price. Aloin and cathartic acid are indicated in slight constipation, while colocynthin and citrullin are valuable in chronic constipation. Aloin is the mildest of the four drugs, citrullin the most active.

Pyoktanin.—M. Heimann,¹¹⁶_{Feb.} in a case of idiopathic pyalism

in a woman of 50 years, obtained temporary success with iodide of potassium. The saliva became less fetid and diminished considerably, and the buccal mucous membrane became less tumefied. But seven weeks later the patient returned to hospital, complaining of a return of all her symptoms. Recourse to iodide of potassium resulted in failure, and the author then tried applications of a solution of pyoktanin to the entire buccal cavity twice a day. The results were excellent; in three weeks recovery was complete and has remained permanent. Moncorvo⁶⁷³_{Oct., '92} gives preference to yellow pyoktanin (auramin) for children. Its local application seemed to hasten cicatrization, the patient meanwhile, however, taking mercury and the iodides. The use of pyoktanin pencils in fistulous tracts left in incompletely cicatrized abscesses gave good results. No toxic effect from absorption of the drug was observed.

Ortiz de la Torre²_{June 11} proclaims himself as against the use of subcutaneous injections of pyoktanin in epithelioma. In cases in which he employed it, comprising epitheliomata of the face, nose, shoulder, etc., its therapeutic action was *nil*, and in one case its use was followed by alarming inflammatory symptoms.

Quinine.—Grimaux and Laborde⁹²⁷_{Oct., '92} give the results of their experience with quinine hydrochlorate, which is much more easily soluble than the simple sulphate, and more quickly absorbed by the stomach. For hypodermatic use it is superior to all other soluble salts of quinine, since 1 cubic centimetre ($15\frac{1}{2}$ minims) contains 0.50 gramme ($7\frac{1}{2}$ grains) of the salt. The posology is simple, as it contains the same quantity of quinine as the sulphate; while, being much more dense, the same doses are much smaller in size and can be administered in very small wafers. It possesses, in the highest degree, the physiological and therapeutic properties of the quinine salts.

Alfödi¹¹⁶_{Feb.} says that, in infected wounds which show no disposition to heal, treatment with a 1-per-cent. solution of sulphate of quinine cleanses them rapidly and tends toward recovery with greater rapidity than with a dressing of sublimate or iodoform. Wounds not infected also recover with astonishing rapidity under its influence.

Grosskopff¹¹⁶_{Oct., '92; Feb.} reports the effects of 75 grains (5 grammes) of quinine in a single dose. The patient had been ordered six 15-grain (1 gramme) powders, and, finding that one powder was of

much service to him, he took the remaining five in a single dose. He became unconscious in about an hour. Two hours after the large dose had been taken, Grosskopff found him still unconscious, face pale, the whole body icy cold, the pulse small and frequent, the breathing superficial and accelerated. Two "ether camphor" injections were administered, and frictions to the chest employed. After about an hour the patient recovered consciousness and opened his eyes. When asked how he felt, he said "Well, but I can see nothing." He then fell asleep, and when he awoke, a few hours afterward, he said he felt well, but that the room was dark, although there was a bright light burning in it. In a few minutes after this, however, the room appeared to be lighter, and he could see things on the wall. Next day he was quite well. During the whole time he never complained of noises in the ears or difficulty in breathing. It is worthy of remark that the malarial attacks, for which he was ordered the quinine, did not recur after the dose of 75 grains (5 grammes). In a case seen by Mettler,⁵⁹_{Apr.22} a single grain of quinine caused a profuse red rash, intolerable itching, and slight puffiness of the hands.

Resorcin and Ichthyol.—Having failed with the usual remedies in acne rosacea, Petrini¹⁰⁴⁵_{May} tried repeated applications, for three consecutive days, of the following mixture: Resorcin, 1 gramme (15½ grains); ichthyol, 2 grammes (31 grains); elastic collodion, 30 grammes (1 fluidounce). The affected portions of the nose, forehead, and chin, and the scattered nodules were treated and abscesses were emptied of the pus by means of Vidal's scarificator. In five or six days the nodules diminished in size and the redness disappeared. The applications were repeated two or three times and cure resulted within three weeks. The author insists upon the necessity of dissolving the resorcin and ichthyol in elastic collodion. In one of these cases, failure resulted from the prolonged use of ichthyol and vaselin.

Salacetol.—This new substance, introduced by P. Fritsch⁵⁷⁵ as a substitute for salol, is obtained by the double decomposition of monochloracetone and salicylate of sodium. It occurs in the form of long crystals melting at 71° C. (160° F.) insoluble in cold water and with difficulty soluble in cold alcohol, but readily soluble in hot water, in lukewarm alcohol, ether, carbon bisulphide, chloroform, and benzol. It readily forms an emulsion with ammonia,

or the diluted solution of a caustic alkali. Salacetol is superior to salol in that the salicylic acid is combined with a non-toxic body.

Salicylic Acid.—Ozegonski ⁵⁸⁶_{No.14} has used salicylic acid as a tænistige with success. After fasting all day, the patient takes 30 grammes (1 ounce) of castor-oil in the evening. At 7 o'clock next morning, 15 grammes ($\frac{1}{2}$ ounce) more of castor-oil is taken, and from 8 to 12 1 gramme ($15\frac{1}{2}$ grains) of salicylic acid hourly. If the tænia be not expelled by 1 o'clock, 15 grammes ($\frac{1}{2}$ ounce) more of castor-oil is taken. The author has only failed once in twenty cases with this treatment. He is of the opinion that the salicylic acid acts as a tænistige only in cases in which recourse has not been had to other treatment.

G. Dock, ⁸⁰_{Feb.1} basing his arguments upon personal observations and the literature of the subject, sums up in the following manner the treatment of pleurisy with effusion: 1. Salicylic acid and its salts may be regarded among the best remedies in pleurisy with effusion. 2. The salicylates act efficaciously in pleurisy with serous effusion, acute or chronic, being sometimes useful even in secondary pleurisy. 3. Their action in purulent pleurisy is very doubtful. 4. While acting as diuretics, the salicylates at the same time modify the pathological process and influence the cause of the disease. 5. The salicylates act more energetically in pleurisy than all other so-called diuretics. 6. Pleurisy is of shorter duration if treated by the salicylates than if treated by diuretics, common salt, and tonics. 7. It is well to prescribe the salicylates from the beginning of the disease, in daily doses of 4 grammes (1 drachm) of salicylic acid, or 4 to 8 grammes (1 to 2 drachms) of salicylate of sodium or salol; the desired result being obtained, the dose may be diminished to half or third of the initial quantity.

Salicylate of Mercury.—See Mercury.

Salipyrin.—Moncorvo ⁶⁷³_{Oct., '92} has studied the action of salicylate of antipyrin, or salipyrin,—a white, crystalline powder resulting from a mixture of 57.7 parts of antipyrin and 42.3 parts of salicylic acid. Its feeble solubility in water renders its administration quite difficult to very young children, on account of the large quantity of alcohol necessary for its solution; the remedy must be given in solution, very young children being unable to swallow wafers. The author gave the remedy in daily doses of 3 or 4

grammes (45 to 60 grains), giving a first dose of 2 grammes (30 grains), and following it with hourly doses of 0.25 to 0.50 gramme (4 to $7\frac{1}{2}$ grains). The antithermic power of salipyrin was found to be much inferior to that of antipyrin alone in proportional doses. The defervescence obtained by means of this remedy was relatively shorter in duration than that following the use of antipyrin. In several cases of acute articular rheumatism in children, the action of salipyrin was inferior to that of antipyrin. It was, however, well tolerated.

Salocol.—P. Schering ⁵⁷⁵_{Mar.16} recommends this drug, which is a salicylate of phenocoll, intended, according to the author, to replace the hydrochlorate of phenocoll, which has certain disadvantages. Salocol produces neither pain in the stomach, modification of the blood-pressure, nor cyanosis. It is an antipyretic, antineuralgic, and antirheumatic, certain in its action and presenting little danger. The dose is 1 to 2 grammes ($15\frac{1}{2}$ to 31 grains) several times a day, given in the form of a powder. It is well tolerated by children. It is also efficacious in influenza.

Salol.—P. Cornet, of Paris, ⁷³_{Oct.29,'92} has made some experiments upon dogs to determine whether the decomposition of salol takes place exclusively in the intestine. He confirms the statements of Nencki and Sahli that at the end of an hour decomposition occurs in the intestine, but that this is no longer the case at the end of two or three hours, as he found salicylic acid in the stomach at the end of that time. He thus refutes the theory of Lépine, of Lyons, who attributes to the pancreatic juice the power of decomposing salol, and reaches the following conclusions: 1. Salol is first decomposed in the intestine. 2. Salicylic acid is found in the stomach two or three hours after the ingestion of from 2 to 3 grammes (31 to 46 grains) of salol. 3. Salol is not completely decomposed in the intestine, as some is found in the fæces. The same author ⁷⁴_{Feb.4} continued his researches on salol by determining the method of its elimination. Phenol is usually eliminated by the urine in too small quantities to be estimated by the usual tests. Salicylic acid is eliminated in the form of salicylate of soda, and appears in the urine only at the end of an hour and a half after the ingestion of salol, the time of elimination depending upon the quantity ingested, being, for 0.50 gramme ($7\frac{3}{4}$ grains), never less than twenty-four hours. It therefore appears that salol decom-

poses very slowly in the organism; for salicylic acid itself, when ingested, appears in the urine in the course of several minutes. By delicate analyses, Cornet has observed that the ingestion of salol increases the excretion of urea and uric acid.

Grossi³⁹⁹_{No.11} has used with success subcutaneous injections of salol in the treatment of tuberculosis. In a great majority of cases night-sweats and fever disappeared, the spells of coughing were farther apart, and the bacilli apparently diminished in the expectoration. Salol is used in an oily solution after the following formula: Oil of sweet almonds, 30 grammes (1 ounce); salol, 10 grammes ($2\frac{1}{2}$ drachms). The injection is made with a syringe of a capacity of 5 cubic centimetres ($1\frac{1}{4}$ fluidrachms). In the first sitting the author injected 5 cubic centimetres ($1\frac{1}{4}$ fluidrachms) of the solution; in subsequent sittings he increased the dose (two to three injections per day), in order to attain a total daily dose of 5 grammes ($1\frac{1}{4}$ drachms) of dry salol (20 cubic centimetres—5 drachms—of the solution). Injected under the skin, salol undergoes the same modification as when absorbed by the digestive tube,—that is to say, it decomposes into carbolic and salicylic acid. The latter may be found in the urine about twenty minutes after injection. The injections are preferably made in the buttocks, because no local reaction follows; they should not be made too frequently, however, as in the end they may produce painful induration.

Volkovitch⁵⁸⁶_{No.16} has employed salol in two hundred cases of diarrhoea occurring in a locality in which cholera was raging. In spite of the absence of any bacteriological examination, he regarded the cases as choleraic diarrhoea. From 1 to 2 grammes ($15\frac{1}{2}$ to 31 grains) of salol were given at first, and in twenty-four hours the patients took from 8 to 10 grammes (2 to $2\frac{1}{2}$ drachms). Children were given, every two or three hours, as many decigrammes of salol as their years numbered. Buzzing in the ears and vertigo were the only untoward symptoms, and the latter was but rarely observed. The diarrhoea generally ceased forty-eight hours after treatment was begun. Girode, of Paris,⁹²⁷ presented before the Biological Society of Paris two lumps of salol found at the autopsy of a woman who died of cholera. She had taken, at intervals of three hours, six doses of salol, each 0.50 gramme ($7\frac{3}{4}$ grains). These two masses found weighed 1.55 and 1.25 grammes

(24 and 20 grains), respectively. It was thus shown that but an insignificant portion had been utilized. The contents of the stomach was rich in microbes, and particularly in the comma bacillus, thus showing that salol is entirely inutile in cholera. It may also be asked if it is not dangerous, for these hard masses in contact with gastro-intestinal lesions might lead to grave secondary lesions.

Carbolic acid and salicylate of sodium having been found efficacious in the treatment of diabetes mellitus, A. Nicolaier¹¹⁶_{Mar.} has tried salol, which, as is known, is reduced to carbolic and salicylic acid in the intestine. He administered the drug in wafers of 2 grammes (31 grains) each, three times a day (6 grammes— $1\frac{1}{2}$ drachms—in twenty-four hours), to seven cases, with the following results: The salol was at times effective in cases where salicylate of sodium had failed. Glycosuria diminished considerably or completely disappeared, and azoturia sometimes was diminished; thirst was lessened and the general condition ameliorated. These effects were sometimes observed even with a mixed diet, and persisted some time after the discontinuance of the drug. In three cases out of seven, however, the drug failed. It is incontestable, therefore, that, in spite of some success, salol is inferior to a strict anti-diabetic regimen, and should not be used except when such a diet cannot be borne by the patient. Usually 6 grammes ($1\frac{1}{2}$ drachms) of salol daily can be well borne. Its use should be suppressed as soon as the symptoms of intoxication appear,—loss of appetite, nausea, vomiting, buzzing in the ears, and albuminuria. Salol is absolutely contra-indicated in albuminuria. Bazy, of Paris,¹⁴_{July 2} states that salol, given by the stomach, is a powerful antiseptic, especially of the genito-urinary organs. For this purpose the doses should be sufficiently large,—that is, 4 or 5 grammes (1 or $1\frac{1}{4}$ drachms) in twenty-four hours. It will then also act upon grave attacks of fever, whether spontaneous or due to catheterism, in which case the catheterization may be continued with impunity and without causing any fever whatever. This special elective action of the drug is constant.

Salophen.—Koch⁶⁹_{May 4}, ¹¹²_{Aug.} says that salophen acts quickly and satisfactorily in acute articular rheumatism, and is more satisfactory than salicylate of soda and salol, because its effects are not so unpleasant. The more acute the case, the more satisfactory the action of the drug. It acts as an antipyretic in other diseases than

rheumatism, and may be used in such cases in doses of 15 to 60 grains (1 to 4 grammes). It is of little value as an antiseptic. Its chief use is in the great field of nervous affections, as neuralgias, pleurodynia, hemicrania, etc. In slight cases it may be used in doses of 10 grains (0.65 gramme), but in severe cases the dose may be 45 or 60 grains (2.93 or 4 grammes). It is best given in the form of powder in 10- to 15-grain (0.65 to 1 gramme) doses, and may be used as high as 45 to 80 grains (2.93 to 5.3 grammes) without disagreeable effects. Osswald ⁶⁹_{Apr. 20;} ¹¹²_{Aug.} has also used salophen in various diseases,—acute rheumatism, chronic rheumatism, headache, etc. He concludes that it is a drug which undoubtedly possesses many of the advantages of the other saline preparations. It is tasteless, odorless, and non-hydroscopic. It has no ill effects in doses as high as 2 drachms (8 grammes) daily. It is less active than salicylate of sodium, because it contains less salicylic acid. It may be advantageously used in the following conditions: In mild cases of acute articular rheumatism, or as a temporary substitute for salicylate of sodium when the latter disagrees. It may be given to weak individuals and to persons who have an idiosyncrasy against sodium salicylate. He especially recommends it in neuralgias of all sorts, especially in hemicrania and headaches in the course of chlorosis and anæmia. In severe cases of articular rheumatism salicylate of sodium will still hold its place. Caminer ¹¹⁶_{Oct., '92} has used the drug successfully in two cases of supra-orbital neuralgia and in two cases of acute rheumatism. The dose was 1 gramme (15½ grains). If given in the early stages of migraine, it aborts the attacks, but does not limit their frequency. Hitschmann has used salophen in acute rheumatism, giving it in single doses of 0.5 to 1.00 gramme (7½ to 15½ grains), the usual daily amount being 6.00 grammes (1½ drachms), and the maximum 8 grammes (2 drachms). The results in acute rheumatism were almost specific. The temperature was rapidly lowered, the pain generally disappearing on the third or fourth day, and only the stiffness remaining. The drug did not, however, prevent the spread of the disease to new joints, relapses, or cardiac complications. It was successful in one case in which the other salicylates had failed, and in another in which they were not tolerated. The only untoward symptom was slowing of the pulse. Hitschmann also used salophen as an analgesic with success, the drug being eliminated with the sweat

in small quantity, as is the case with salicylate of sodium, antifebrin, and phenacetin.

Sodium Bicarbonate.—Huchard ³⁵_{Mar.} recommends the administration of successive doses, 2 to 10 drachms (40 grammes), daily, of sodium bicarbonate in the hyperacidity of the stomach sometimes present in diabetes. He mentions a case with the premonitory symptoms of coma, in which he employed about 10 drachms of the sodium salt daily, warding off the attack successfully. He recommends this treatment also in the gastric crises of tabes, cardiac disease with acidity of the stomach, diseases of the liver, and, under certain conditions, in gall-stones. Linossier, of Paris, and Lemoine, of Lyons, ¹⁰_{Mar. 28} have studied the action of bicarbonate of sodium in the digestion of a man affected with rumination. The following are some of their conclusions: Bicarbonate of sodium, in all doses, even 10 grammes ($2\frac{1}{2}$ drachms), stimulates the gastric secretion; a small dose consists of 0.50 gramme ($7\frac{3}{4}$ grains) at meal-time, or 1 gramme ($15\frac{1}{2}$ grains) one hour before; an average dose, 5 grammes ($1\frac{1}{4}$ drachms) one hour before meals, or 1 gramme ($15\frac{1}{2}$ grains) immediately before; a large dose, 10 grammes ($2\frac{1}{2}$ drachms) one hour before meals, or 5 grammes ($1\frac{1}{4}$ drachms) at the beginning of the repast. The dose of 5 grammes ($1\frac{1}{4}$ drachms) one hour before meals produces the greatest amount of stimulation.

The action is prolonged beyond the day of administration, and the drug is therefore indicated in cases of gastric insufficiency. It is administered preferably some time before meals. In excess of hydrochloric acid, it is only a palliative and may aggravate the disease by stimulating the already overexcited mucous membrane. The administration of hydrochloric acid would probably be of more service, by diminishing the activity of the secretion, acting as does alcohol in alcoholic fermentation, and lactic acid in lactic-acid fermentation. This action will be verified by the authors in future experiments.

Sodium Cantharidinate.—Schulze ³⁴_{No. 48, '92} has used this remedy in twenty-one cases of laryngeal, pharyngeal, nasal, and pulmonary phthisis and lupus, with very unfavorable results, the application being very painful. Irritation of the kidneys, proved by the presence of albumen in the urine, occurred in seven cases. The author, therefore, no longer applies the method.

Sodium Fluoride.—Blaizot⁹²⁷ writes upon the use of fluoride of sodium as an antiseptic. The therapeutic dose of this drug in the rabbit is 0.08 gramme ($1\frac{1}{4}$ grains), and the toxic dose 0.10 gramme ($1\frac{1}{2}$ grains). It is therefore about sixteen times less toxic than corrosive sublimate and sulphate of copper, and twice less toxic than carbolic acid. A solution of 1 per cent. and even $\frac{1}{2}$ per cent. prevents the development of pyogenic bacteria (staphylococci, streptococci, and others). These solutions may be advantageously employed for the hygienic care of the skin and mucous membranes, for surgical disinfection, for the dressing of wounds of all kinds, and for the treatment of certain dermatoses, as erythema, impetigo, prurigo. The solutions are injurious to iron and steel instruments, but do not alter nickel; at least, for a certain time.

Sodium Phosphate.—Crocq, the younger, of Brussels,⁸⁶⁸
Oct. 1, '92 finding upon examination that the Brown-Séquard preparation of testicular fluid contained a large proportion of phosphates, and especially of phosphate of sodium, decided to utilize this latter salt without having recourse to the more complicated method necessary for the extraction of testicular juice. He made use of a solution containing 2 grammes (31 grains) of phosphate of sodium and 100 grammes ($3\frac{1}{4}$ fluidounces) of cherry-laurel water. This liquid, absolutely aseptic, was injected, in doses of 3 cubic centimetres (46 minims) every two or three days, into the arms and legs. The pain was insignificant, especially when the injection was made with strict antiseptic precautions. He resumes his results as follows: 1. No local or general reaction is produced by an injection of a $\frac{1}{50}$ solution of sodium phosphate. 2. A powerful action is observed by injecting every day, at first, 1 cubic centimetre ($15\frac{1}{2}$ minims), then every two days 3 cubic centimetres (46 minims) of this solution. 3. It acts purely as a nervous tonic, the results being curative or palliative,—curative in diseases not depending upon a functional trouble of the cerebro-spinal axis; palliative when organic lesions of the nervous centres are present. 4. Its superiority over the methods of Brown-Séquard and Constantin Paul consists in its simplicity, putting it within the reach of all.

Francotte, of Liège,²⁹³
Feb. has experimented with Crocq's method in nervous diseases, using a solution containing phosphate

of soda, 2 grammes (31 grains); cherry-laurel water, 50 grammes ($1\frac{1}{2}$ fluidounces). Injections were made every two days or three times a week, according to the cases, one, two, or three Pravaz syringefuls being used. In one case ten syringefuls were reached little by little. The injections were not painful and produced no local accidents. No dynamogenic symptoms were observed immediately after the injection, the dynamometer registering about the same figures. The results might be divided into negative, positive, doubtful. Francotte does not share in Crocq's enthusiasm as to the value of the treatment, though he believes it capable of rendering some service in nervous diseases, more as a reconstituent than as a neurasthenic remedy.

The most noteworthy results were improvement of nutrition and increase in weight, rather than a direct modification of the nervous condition.

Sodium Salicylate.—Cassaët, of Bordeaux, ¹⁸⁸_{Mar. 6} discusses the efficacy of salicylate of soda in biliary lithiasis, and as a cholagogue. He showed two biliary calculi found in the stools of a patient of 50 years, who for eight years had suffered from hepatic colic. Various methods of treatment had been resorted to, and two seasons had been spent at Vichy without success. The general health was disturbed; there was cardiac and circulatory trouble, with symptoms of biliary infection. Cassaët administered a daily dose of 5 grammes ($1\frac{1}{4}$ drachms) of salicylate of sodium for fifteen days, until slight icterus appeared; he then prescribed 300 grammes (10 ounces) of olive-oil to be taken in six doses, half an hour apart and during three days. On the first day a calculus was expelled, and on the third day, after a violent attack of colic, but without chill, a very large calculus was expelled. Improvement was immediate; the tricuspid murmur disappeared, as well as the œdema of the lower limbs. Cassaët shows the necessity of procuring antisepsis of the biliary passages before causing the expulsion of the calculi.

Erlanger, of Munich, ³²⁶_{v.3} has administered this drug *per rectum* to twenty-five patients for acute articular rheumatism. To produce beneficial results, an aqueous injection should first be given the patient to evacuate the intestines, and the solution should be heated to a temperature equal to that of the human body. The author gives preference to the following formula:—

R Salicylate of soda, . . .	6 to 8 grammes (1½ to 2 drachms).
Water,	100 grammes (3½ ounces).
Tincture of opium, . . .	5 grammes (1¼ ounces).
Sig. : For one injection.	

The best instrument for giving this clyster is the ordinary injection-syringe of 100 cubic centimetres' ($3\frac{1}{4}$ ounces) capacity, joined with an œsophageal sound, which may be made to penetrate twenty centimetres into the large intestine. It is important that the injection be retained as long as possible in the intestines, in order to produce the desired therapeutic effect.

Soziodol.—P. Guttman¹¹⁶_{Jan.} has tried insufflations into the nose of sodium soziodol in thirty cases of whooping-cough. He used at first the formula recommended by Schwartz: Sodium soziodol, 95 per cent.; myrobalan fruit, 5 per cent. (Myrobalan is well known in the Orient as a medicinal plant, rich in tannin—45 per cent. It contains also some gallic acid.) Later, the author had recourse to pure sodium soziodol. The insufflator was inserted into the nostril as high up as possible, care being taken not to let the tube become obstructed by mucus, and the powder insufflated until some of it appeared in the other nostril, in which the same operation was repeated. If the soziodol should be expelled by a fit of coughing, it may be renewed after a short time. The results obtained were encouraging, the attacks diminishing in intensity and frequency after three to six days' treatment.

Steresol.—Berlioz, of Grenoble,¹⁰_{June} describes a new antiseptic agent, steresol, which is applied to the surface of the mucous membrane and of the skin like a varnish, and which adheres perfectly. By numerous experiments, the author has established the decided bactericide property of steresol, and has proven that phenol, which forms its active element, does not evaporate entirely from the layer of varnish until after twenty-four hours. Steresol has been in use since three months in the Trousseau Hospital, for the treatment of diphtheria; it gave an important proportion of cures; its application is easy and not painful, and it never causes cicatrices. The layer of varnish remains in position several hours. Steresol may equally well be used in the treatment of tuberculous ulcers of the skin and of the tongue. It permits of a permanent antiseptis of the mucous membranes and of portions of the body in which dressings cannot be *in situ*. The formula of steresol is as follows :—

R Gum arabic, purified and soluble in alcohol,	270 grammes (8½ ounces).
Benzoin, purified and entirely soluble in alcohol,	
Balsam of Tolu, each	10 grammes (2½ drachms).
Crystallized carbolic acid,	100 grammes (3½ ounces).
Essence of cinnamon,	
Saccharin, each	6 grammes (1½ drachms).
Alcohol, in sufficient quantity to make one litre (quart).	

Strontium.—Coronedi,³_{Sept., '92} having succeeded in favorably influencing the incoercible vomiting of pregnancy by means of bromide of strontium, tried the drug in other cases of vomiting of various kinds. Success was met with in every case, and the author advises that doses of 1 gramme (15½ grains) be kept in glass tubes and taken immediately before meals, in unleavened bread. The daily dose prescribed by him varies from 2 to 3 grammes (31 to 46 grains). Laborde and Malbec¹⁶⁴_{Dec. 16, '92}; ¹⁵¹_{Feb.} find that iodide of strontium is analogous in action to potassic iodide, but less energetic than the latter. Their experiments were made with a view of finding out the effects of the new remedy on the heart and circulation. After intra-venous injection of a 10-per-cent. solution, the manometer curve indicated a rise in arterial pressure coming on quickly, and attended with an increased heart-rate. This condition, however, is only temporary, and is succeeded by a slowing of the original cardiac action. The pressure alteration is of longer duration, but the remedy is to be regarded as one of comparatively short effect. The authors admit that the injection of distilled water into the veins will reproduce the arterial rise, but the other effects noted above do not follow. The strontium salt is innocuous and can, therefore, be used under the same general conditions as the iodide of sodium and potassium, without many of the disadvantages and dangers which these salts, and particularly the latter, possess. It does not upset the stomach. There are no headache, coryza, salivation, nor cutaneous eruptions. No claim is made that the strontium salt is of any service in syphilis. The remedy can be given in 30-grain (2 grammes) doses, either in distilled water or syrup. It is better to commence with 15-grain (1 gramme) doses and gradually increase.

Strychnine.—Henry Smith²_{Dec. 10, '92} has employed this drug to arrest vomiting in individuals affected with intense anæmia and weakness. He describes the case of an English officer suffering from these symptoms, all the usual medicaments having proved

utterly useless. Large doses of strychnine effected a speedy cure. Improvement began in twenty-four hours, and the patient, reduced to a living skeleton, at the end of some weeks became perfectly healthy and able to return to service. The author had equally great success in other cases, and believes that strychnine here acts as a tonic of the nervous centres which preside over the movements of the stomach.

Keener¹⁰⁹_{June} recommends the treatment of alcoholism by subcutaneous injections of the following solution:—

R Nitrate of strychnine,	gr. ij (0.13 gramme).
Picrotoxin,	gr. j (0.06 gramme).
Boiling water,	℥j (30.00 grammes).

At first about 10 drops are injected, and the dose is increased by 2 drops at each injection, until a slight dizziness or a constriction of the throat is felt; this usually occurs after an injection of from 16 to 20 drops. The dose is then diminished until the cessation of the above-mentioned symptoms; the dose thus reached being continued until symptoms of intoxication again occur, which is generally the case after from seven to ten days. The dose is then very gradually diminished until it only consists of several drops, when the subcutaneous injections are to be entirely omitted. The following solution is also to be taken internally:—

R Bichloride of mercury,	gr. i-ij (0.06-0.13 gramme).
Fluid extract of kola,	℥j (4.00 grammes).
Fluid extract of cactus grandiflorus, .	℥j (30.00 grammes).
Fluid extract of arnica,	℥iiss (10.00 grammes).
Fluid extract of aloes,	℥ij (8.00 grammes).
Tincture of India hemp,	℥ss (15.00 grammes).
Distilled water, sufficient quantity to make	℥iv (120.00 grammes).

To be taken in teaspoonful doses every two hours during the day. This is to be continued during the entire period of the injections and for several days after their cessation, after which a tonic of iron, quinine, and strychnine (in any form, perhaps combined with iodide of potassium) is to be taken for one month. Attention must be directed to having the patient's bowels move regularly, and to the fact that a sufficient quantity of urine should be secreted.

Sulphonal.—Lépine³ regards sulphonal as not only a valuable hypnotic, but valuable in the treatment of diabetes and certain nervous affections, especially chorea and the trismus of newborn

infants. Its use, however, is attended with danger from too-large doses, or the too-prolonged use of small quantities. The most prominent symptoms of sulphonal poisoning are: Vomiting, constipation, sometimes ataxic nervous trouble with partial loss of reflexes, rarely a rash, and lastly a diminution in the amount of urine secreted, which becomes of a peculiar red color and contains coloring matter from the bile, mucin, albumen, leucocytes, numerous red globules, and epithelial casts. Prolonged use induces aural vertigo, headache, and loss of brain and muscular power. This condition may end in somnolence and stupor, loss of speech, occasionally ptosis, œdema of the lids, and cyanosis. These are but a few of the symptoms termed "sulphonalism,"—a condition somewhat similar to morphinism, since suppression of the drug brings on vertigo, motor troubles, weakness and digestive disturbances; so that at times it is somewhat difficult to decide whether the symptoms are caused by the medicine or the disease.

Kast, ²⁷³_{V.81, No.1} who introduced sulphonal into therapeutics, replies to the objections made to its use. It is generally admitted that in doses of from 2 to 3 grammes (31 to 46 grains) for a man, and 1 gramme ($15\frac{1}{2}$ grains) for a woman, no toxic symptoms arise. If these doses be exceeded, vomiting, diarrhœa, and various nervous and urinary phenomena occur. These accidents, according to Kast, cannot be explained except by anatomical alterations of the kidneys, due to the large doses of the drug. The maximum dose should be from 2 to 3 grammes (31 to 46 grains) for men and 1 gramme ($15\frac{1}{2}$ grains) for women; and this amount should never be exceeded, except to combat intense excitement, as in insane patients. When it is necessary to continue the use of sulphonal, intermissions of several days should be made from time to time; and it should be stopped as soon as the patients show such symptoms as nausea, vomiting, gastric pain, etc. Administered with these precautions, sulphonal is a harmless medicament.

Terpin.—W. Murrell ²_{Mar.4} again calls attention to the favorable action of terpin upon lesions of the bronchial and nasal mucous membranes. Its only inconvenience is that it is insoluble in water; it dissolves in alcohol only in a proportion of 1 to 10. The author has used it for several months as an elixir, with cherry-laurel water as an aromatic. It not only relieves cough, but acts at the same time as a diuretic and antineuralgic.

Teucrin.—Mosetig-Moorhof⁶⁵⁰_{p.86} has recently proposed the treatment of microbial affections by teucrin, which is an extract of *Teucrium scordium*, a plant of Central Europe, the extract being a brown liquid with an acrid taste. The author has used teucrin for five years without publishing his results, especially in the treatment of cold abscess, making injections in the neighboring tissues. The effects produced were of two kinds,—one general, the other local. The first observed are the general modifications, the local effects becoming apparent two days later. There is at first an intense febrile reaction, persisting ten or twelve hours. About four hours after the injection the temperature rises gradually to 39° or 40° C. (102° or 104° F.), becoming normal after ten or twelve hours. There are chills and acceleration of the pulse, but no change in the urine. As to the local effects, an injection of teucrin may transform a cold abscess into a warm one, as was observed more than two hundred times by the author. The skin covering the abscess reddens, the temperature rises, and the purulent collection, formerly indolent, becomes extremely sensitive to pressure. If left alone, the abscess becomes smaller after several days, and the phlegmonous symptoms disappear. If the abscess be incised on the third day, the cavity fills up and cicatrization is complete in fifteen days. Analogous results were obtained in cases of tuberculous adenitis.

Thilandin.—E. Saalfeld¹¹⁶_{Jan.} has experimented with flexible thilandin in moist, vesicular, papular, and encrusted eczema, as well as in contagious impetigo of the face, neck, and scalp, especially in infants. His results were excellent, the drug in some cases being superior to tar. The itching was greatly relieved. It also favorably influenced artificial dermatitis due to pyrogallie acid, corrosive sublimate, etc. It was successful in several cases of eczema of the scrotum and twelve cases of sycosis vulgaris. In three cases of ichthyosis, it is interesting to observe that, though a real cure was not obtained, still the results were better than with any other preparations used. The author believes that the flexible thilandin is fully as efficacious as the ordinary thilandin, while it may be employed in all scalp affections in which an ointment is indicated.

Thiol.—A. Budder⁶⁹_{No.24} points out the prevalent errors in the treatment of burns, and the neglect of the principal rules for the

management of all wounds, viz., rest, absence of all irritation and of all infections. These requirements are fully met by thiol, the method of employment of which is very simple. The wounds are bathed in a 50-to-100 solution of thiol, ordinary cotton applied, with a compress. The author cites several personal cases showing the value of thiol in burns.

Moncorvo ⁶⁷³_{Oct., '92} has employed thiol in more than one hundred infantile cases for the purpose of diminishing suppuration and for the removal of cutaneous growths, either of parasitic origin (tinea tonsurans, favus, pityriasis, etc.) or dependent upon general dyscrasiæ (tuberculosis, syphilis, etc.). Thiol may be used with equal efficiency in the dry form (thiol powder), pure or rubbed up in vaselin (5 to 10 per cent.), or in the liquid form, pure or diluted with boiled sterilized water. Its topical use was never followed by the least untoward local or general effect. The therapeutic effect was satisfactory in every case. It was used, without fear of danger, on the youngest children. The author has used thiol in the treatment of erysipelas and lymphangitis in adults with the greatest success.

Thiophen.—Topolanski ³⁵⁷_{Jan. 15} has successfully employed biniodide of thiophen combined with sugar in the treatment of blennorrhagic conjunctivitis in the adult and the newborn, in blennorrhagia of the lachrymal duct, in abscess of the cornea (after preliminary cauterization), and in dendritic keratitis. It was also of service in the treatment of open wounds and infected surfaces, being in this respect superior to iodoform, diminishing the secretions and hastening the formation of granulations. It is without action in catarrhal conjunctivitis and in deeper inflammations, such as iritis. Insufflation of the drug causes somewhat intense pain lasting about ten minutes; ciliary injections and other phenomena of irritation ordinarily disappear in half an hour. The author considers the drug of value in the above affections, and as a substitute for iodoform, on account of its desiccating power and the absence of odor and secondary symptoms.

Thiosinamin.—Hebra, of Vienna, ³_{Sept. 21, '92} gives the result of his employment of thiosinamin, or allylsulphocarbamide. Injected into patients affected with lupus, a local reaction took place, but no action upon the organism; after this reaction, which lasted several hours, desquamation of the diseased parts followed, and at the end

of several weeks the improvement was incontestable. The drug also exercised a favorable action upon the cicatricial tissue, which it softened. It also caused diuresis, without any bad effects upon the kidneys or heart. Hans, of Vienna, ¹¹³_{Feb. 10} has attempted to utilize thiosinamin in dissolving the cicatricial tissue in stricture of the urethra. In two cases the results obtained were favorable. The conclusions arrived at by the author are as follow: 1. Adults support favorably subcutaneous injections of a considerable quantity ($\frac{1}{2}$ to 1 Pravaz syringeful) of 15-per-cent. alcoholic solution of thiosinamin. 2. Softening of the cicatricial tissue follows in a couple of hours, but the influence is not permanent, while complete cure of the stricture never occurs, or only after a great number of injections. In the first case cited by the author the improvement lasted three months and a half; four injections in all were given (2 of $\frac{1}{2}$ and 2 of a full Pravaz syringe); but at the end of that time the stream of urine became very weak and the patient again had great difficulty in urinating. Latzko ⁵⁷_{Feb.}; ²_{May 26} has tried thiosinamin in forty gynæcological cases (large tumors of the uterine appendages, slight perimetritic and salpingitic inflammations, and displacements of the uterus), and has found it to have a softening action on cicatrices. In uterine retroflexion all troubles disappeared after a short time. The patients, almost all of whom belonged to the working class, were able to resume their usual work, and the large growths became smaller.

Thiuret.—F. Blum ⁶⁹_{No. 8} has studied this drug as regards its antiseptic and bactericidal action. It is obtained by oxidation of phenyldithiobiuret, and is a crystalline powder, inodorous, insoluble in water, soluble in alcohol and ether. Mixed with alkalies sulphur is set free, and it is to the presence of this sulphur in a nascent state that thiuret owes its antiseptic properties. In fact, when the conditions are such that sulphur cannot be set free, its antiseptic action is *nil*. The bacteriological researches of Blum demonstrate that the sulphur of thiuret is disengaged by many bacteria and also by brewers' yeast, whence its antiseptic action upon the bacteria in question (*bacillus prodigiosus*, chicken-cholera, etc.). If the methyl group be substituted for the hydrogen of the benzol group, thiuret is deprived of all antiseptic action, and brewers' yeast then becomes powerless to disengage the sulphur in a nascent state.

Thymol.—Sandwith, of Cairo, ⁶_{Dec.10,'92} used thymol as an anthelmintic in ankylostomiasis, and confirms the results obtained by Sonsino. ⁶_{Nov.19,'92} He has used the drug in more than two hundred cases in two years. It seems to have a specific action in this parasite, but it is necessary to administer it two or three times, or even oftener. He gives it once a week for two weeks, using ferruginous preparations in the interval to combat the anæmia. At first he administered 90 grains (6 grammes) in six wafers, to be taken in six hours; now he gives 60 grains (4 grammes) in two doses. Even with this quantity he has observed symptoms of collapse, hypothermia, and weakening of the pulse. Great care is, therefore, necessary in the administration of thymol in large doses.

Tolypyrin.—P. Guttman, of Berlin, ⁴_{No.10} has tried this drug as an antipyretic in 20 cases (6 of typhoid fever, 5 of pneumonia, 2 of erysipelas of the face, 2 of scarlatina, 2 of phthisis, 1 of septicæmia, 1 of otitis media, 1 of gangrene of the scrotum). Given in daily doses of 4 grammes (1 drachm), in four parts, at intervals of 1 hour, tolpyrin reduces the temperature 1° to 2° C. (1.8° to 3.6° F.), oftener 2° C. and more. This reduction begins in the first hour and continues until it reaches the minimum in the fifth or sixth hour, after which it commences to rise slowly. It will be seen, then, that the administration of tolpyrin at midday will keep the temperature normal almost to the following morning. The fall of temperature is accompanied by perspiration more or less profuse, especially sweating of the face; the awakening is not followed by a chill. The frequency of the pulse corresponds to the height of the temperature. No secondary phenomena of any sort were observed, apart from vomiting, which occasionally appeared. Therefore, as an antipyretic, 4 grammes (1 drachm) of tolpyrin causes a reduction of temperature almost equal to that produced by 5 or 6 grammes (1¼ to 1½ drachms) of antipyrin. As to the antirheumatic action of the drug, it is very pronounced. Four grammes (1 drachm) of this drug in twenty-four hours (1 gramme—15½ grains—every three hours) are followed, in light cases of acute articular rheumatism, by an improvement in all the morbid symptoms (fever, pain, swelling) in the first twenty-four or forty-eight hours. It is true that in graver cases the amelioration is slower and alternates with exacerbation or localization of the affection in other joints instead of those cured; but in this respect

antipyrin and salicylate of sodium are not shown to be superior to tolypyrin. In twelve cases of headache of different kinds, tolypyrin showed efficacy in six.

Tolysal.—A. Hennig⁶⁹_{No.8} found this remedy efficacious in articular and acute or chronic muscular rheumatism, in doses of 3 to 6 grammes ($\frac{3}{4}$ to $1\frac{1}{2}$ drachms) in twenty-four hours. It is also an excellent analgesic and antipyretic, as well as an antineuralgic. No bad secondary effects are to be observed, and, owing to its low price, it may be prescribed for the poorest patients.

Transfusion.—De Dominicis⁹²⁷ practiced transfusion of dogs' blood in seven cases, three of them young girls suffering from severe chloranæmia resisting all treatment, and four cases of pulmonary tuberculosis. In each case the immediate effect was insignificant: slight pain and chill, and sometimes a slight inclination to vomit; soon afterward, however, a general sense of well-being ensued. There were no bad after-effects. As to the therapeutic results, they were excellent in the three chlorotic patients. Of the four tuberculous patients two rapidly succumbed to the progressive course of the disease, without any apparent influence of the transfusion. The two others were improved; there was return of the appetite and body-weight, the general condition was better, the fever disappeared, and the local phenomena were diminished. Richet, in the discussion, stated that these results were in accord with his own, and that the blood transfused in a natural state must certainly produce the same effects as the serum alone. He adds that dog-serum has no specific action in tuberculosis. It ameliorates the general condition by its remarkable stimulating and tonic properties, and thus puts the patient into the best condition to resist the infection. Brown-Séquard stated that it was easy to understand the tonic properties of the serum of the blood, since it received the products of all the organs; but in this respect the serum of the dog seemed to have a special power. The effects of the injection of several cubic centimetres are so remarkable that one is forced to admit that it contains agents still unknown, which may explain its special properties.

Trional and Tetronal.—Raimoni and Mariottini⁴⁷⁷_{Dec., '92} undertook some experimental and clinical researches as to the physiological and therapeutic action of these drugs. Experiments upon rabbits, dogs, and frogs show that, like sulphonal, trional and tetronal act

upon the cerebral cortex; it is only after large doses, or medium doses frequently repeated, that spinal symptoms appear, such as paresis and reflex excitability. The comparative energy of the drugs is as follows: tetronal, 3; trional, 1.5; sulphonal, 1. The action upon man is the same as upon animals. Given in somewhat large doses, trional and tetronal do not influence the secretion of sweat nor the temperature. Sleep is tranquil, the respiration remaining normal throughout. Tolerance is not established, and it is not necessary to increase the size of the dose if used for any time. However, it is necessary to bear in mind the cumulative effects of the same dose frequently repeated, and to watch for symptoms of poisoning. To guard against this danger, the drugs should neither be prescribed in large doses nor in medium-sized doses frequently repeated. The average dose is 0.5 to 1 or 2 grammes ($7\frac{3}{4}$, $15\frac{1}{2}$, 31 grains) given in one dose. Gummy emulsions or solutions in milk or wine act more rapidly than watery solutions. It should be given in the evening, a quarter or half an hour before retiring.

Horwath ¹¹⁶_{Mar.} made important experiments with trional and tetronal on animals, the result of which showed that they could be classed as hypnotics. He then administered the drugs in doses of 1 to 2 grammes ($15\frac{1}{2}$ to 31 grains) seventy times to twenty-seven patients. The results obtained were only ordinary, possibly because a large number of these patients lived in the same room, those asleep being awakened by the noise of the others. These drugs can be given a half-hour before going to bed, while sulphonal has to be taken very early in the evening. In five other cases trional and tetronal showed themselves much more efficacious, although the doses administered were but 0.50 to 1 gramme ($7\frac{3}{4}$ to $15\frac{1}{2}$ grains). Attention must, above all, be called to the fact that in these cases the patients were not only able to sleep well during the night on which the drugs were administered, but also on the following night. As to the energy of their action, tetronal acts with more intensity than trional. In a case of cholera, a dose of 1 gramme ($15\frac{1}{2}$ grains) of tetronal will be followed by a tranquil sleep of fourteen to sixteen hours' duration. Given in the same doses trional fails completely, while by the administration of 1 gramme ($15\frac{1}{2}$ grains) of sulphonal, a sleep lasting all the afternoon may be obtained.

Randa ⁵⁷_{Mar.5} prefers trional to tetronal or sulphonal because of its

greater efficacy and the absence of all poisonous symptoms from its use. Having a bitter taste, it should be given in as large a quantity of some warm liquid as possible, such as milk, tea, soup, etc. He used the drug in eighteen cases of mental agitation in which sleep was impossible, in doses of from 1 to 3 grammes ($15\frac{1}{2}$ to 46 grains) every evening for two months. The minimum dose is 1.5 grammes ($23\frac{1}{4}$ grains). In some cases sleep supervened after 1 gramme ($15\frac{1}{2}$ grains) had been given, but this dose was generally insufficient. In every case the result was satisfactory. Sleep sometimes came on in a quarter of an hour, and never later than two hours after the administration of the drug, and was always tranquil. In cases of extreme maniacal agitation it lasted about five hours; in simple insomnia, from eight to nine hours. In the latter cases the patients were often drowsy the next day, this sleepiness disappearing generally toward noon, though it sometimes persisted all day. The author insists especially on the value of the drug in general paralysis, where the use of chloral is often followed by accidents. Excepting somnolence, no other untoward effects were observed; but in view of its chemical relation to sulphonal, Randa admits their possibility. No tolerance is established; indeed, the doses may be diminished after a certain time.

Basing himself upon 12 cases, 9 of the hypnotic and 3 of the antihydrotic action of trional, Keppers²⁰⁸⁸ reaches the following conclusions: 1. Trional in doses of 1 to 2 grammes ($15\frac{1}{2}$ to 31 grains) acts as a good hypnotic, rapid and certain, in the most varied cases, being especially efficacious in the excitement of insanity. 2. The secondary effects, such as heaviness, fatigue, and somnolence, which sometimes follow its use, are not marked and soon disappear. 3. It is rarely necessary to give more than 2 grammes (31 grains), and larger doses are not recommended on account of the secondary phenomena. 4. Disturbances of digestion were rarely noted, and those of respiration never. 5. As trional may cause unpleasant effects in patients affected with heart disease, especially where there is defective compensation, it should be prescribed in such cases with the greatest caution. 6. Trional is a good antihydrotic, doses of 0.25 to 0.50 gramme (4 to $7\frac{3}{4}$ grains) being sufficient to cause cessation of perspiration.

Tropacocaine.—This substance, which has been isolated by Giesel, is identical with that made synthetically by Liebermann,

and called by the latter "benzoyl-pseudotropine." Chadbourne³_{Aug.31} has studied its physiological and therapeutic action, and finds that the hydrochlorate of tropacocaine is a powerful local analgesic, much less toxic than cocaine, and fully as effective, its anæsthetic action being more quickly manifested. The watery solution alters more slowly than cocaine. In ophthalmic practice the anæsthesia does not last as long as that produced by cocaine, but this inconvenience is overcome by instilling from time to time a drop of the solution. One or two drops of a 3-to-100 solution of hydrochlorate of cocaine are sufficient for the anæsthesia necessary for operations on the eye.

O. Seiffert,⁵⁷_{Feb.10} after experiments on healthy and diseased patients, while confirming the relatively innocuous character of tropacocaine, calls attention to its disadvantage in laryngological and rhinological practice. A 10-per-cent. and even a 5-per-cent. solution is often irritating, and, while having but slight effect on the vasomotor nerves, operations performed with it are often followed by profuse hæmorrhage. The author advises the use of cocaine, which, in spite of its inconveniences, deserves its reputation, and daily renders most valuable service. G. Ferdinands²_{June 24} regards tropacocaine as a more-certain anæsthetic than cocaine, manifesting a more-profound action for a longer period. It also causes greater anæsthesia of the inflamed tissues than does cocaine, while it does not cause the same cloudiness of the cornea. A solution of 2 to 3 per cent. is generally necessary; but, if deeper layers are to be anæsthetized, a 5-per-cent. solution may be used with safety. Solutions in distilled water may be kept for months without losing their anæsthetic power, while there is no fungous formation. Except in one case, where a 10-per-cent. solution was necessary, no secondary effects were observed. No hæmorrhage was observed, as claimed by Seiffert. The author believes that tropacocaine will supplant cocaine, since, while it is superior as an anæsthetic, it possesses antiseptic properties. Its price is not high, and will diminish as its use becomes more general.

Turpentine.—L. Koutonzoff⁵⁸⁶_{No.17} has studied, in six healthy persons, the influence exerted by spirit of turpentine upon the functions of the stomach, with the following results: 1. In healthy subjects the albuminoids of the food are dissolved in the stomach during the first stages of digestion, when the hydrochloric acid is

still absent. 2. Spirit of turpentine generally begins by diminishing the secretion of the gastric juice, and afterward excites it. This gastric hypersecretion, which occurs immediately after the ingestion of the food, persists for some time after the cessation of the turpentine. 3. Finally, spirit of turpentine slightly hastens the absorption of iodide of potassium and the passage of salol into the intestines,—in other words, it somewhat excites the motility of the stomach and the absorbent power of the mucous membrane.

Vaselin.—G. Hell ⁵⁸⁶_{Nov. 5, '92} recommends for ointments a combination of 25 per cent. of anhydrous lanolin and 75 per cent. of vaselin. Pure lanolin is too expensive, and vaselin cannot always be employed alone; the proposed combination preserves all the properties of lanolin, and it is unnecessary to add water.

Venesection.—Samuel West ²_{Nov. 5, '92} states that, although blood-letting has fallen into disrepute, it should not be forgotten that it may be of great service at times, as, for example, when it is necessary to relieve mechanically an overcharged heart and vessels, as in pulmonary congestion; or, physiologically, to substitute an external hæmorrhage for one threatened internally in a vital organ. He cites several cases of cerebral hæmorrhage and of aortic disease with pulmonary congestion, in which venesection produced favorable effects; and, on the other hand, he gives several cases, among them some of cerebral uræmia, in which the method entirely failed. Robert Somerville ³⁶_{Oct., '92} showed the exaggerations which had arisen in the use of this remedy and the accidents to which its abuse had given rise. Yet he claimed, at the same time, that there are many cases in which venesection is very useful, as, for instance, in pulmonary and cardiac congestions, where moderate blood-letting is attended with good results, as is also the case in apoplexy from cerebral congestion. He recalls, with approval, the fact that several obstetricians of Edinburgh practice venesection after labor in women with cardiac affections. He believes that, while it may not be a curative in inflammation, it gives nature time to act, by causing the disappearance of grave or threatening symptoms. However, it should be employed only in exceptional cases, especially in distension of the right heart and in certain cases of apoplexy.

Sacaze ⁹²_{Jan.} reports two cases of typhoid fever in which he obtained a good result by blood-letting. The first case was that of

a young woman of 29 years, who, on the thirtieth day was attacked with epileptiform convulsions, which were repeated on the days following. On the thirty-second day 6 ounces (186 grammes) of blood were removed. She had two attacks after this, but began to mend, and finally recovered, though in a dying condition when venesection was done. The second case was that of a woman of 22 years, suffering from great weakness and epileptiform attacks, and vomiting from the beginning of the disease. On the tenth day 5 ounces (155 grammes) of blood were withdrawn; the convulsions and vomiting ceased, but the patient succumbed on the fourteenth day to urinary troubles. Sacaze injected some of the blood into animals, finding it to possess exceedingly toxic properties, which would explain the symptoms observed in the patients. He concludes that venesection is of great service in typhoid fever, as well as in other infectious diseases in which the kidneys are involved.

G. Newton Pitt ²_{Apr. 8} reported nine cases of thoracic aneurism, with or without aortic incompetence, in which venesection, more or less frequently repeated, had been followed by more or less permanent relief of the symptoms. In one case the patient was profoundly comatose, and on three occasions was restored to consciousness by venesection. He would advise the method only as a remedy for acute symptoms, such as pain, cough, and dyspnœa, and not with a view of promoting consolidation of the aneurism by clot. He would treat thoracic aneurism by rest, recumbent position, iodide of potassium in gradually-increasing doses, and with as limited an amount of fluid as was comfortable to the patient. Renwick Ross ¹_{Dec. 24, '92} records a case of uræmia successfully treated by blood-letting, in a woman of 42 years, of plethoric habit and suffering from general anasarca from Bright's disease. She was attacked one morning with generalized convulsions and delirium, succeeding intervals of coma, and with great pulmonary œdema. Twenty ounces (622 grammes) of blood, much darker than ordinary venous blood, were drawn from the arm. The patient fell into a quiet sleep, awaking, at the end of three hours, perfectly conscious; the pulmonary œdema rapidly disappeared, the normal flow of urine was established, and the anasarca disappeared in two days.

Xanthaline.—See Opium.

EXPERIMENTAL THERAPEUTICS.

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Acetone.—It is believed by Paul Binet, ¹⁹⁷_{June 20, July 20} from the results of an experimental research, that this agent is rapidly, but feebly, eliminated by the lungs, even when ingested in large doses.

Aconitine.—P. Aubert ²¹¹_{May 7} has made a study of the local action of the different aconitines on the secretion of sweat. He employed the alkaloids of the *Aconitum napellus*, *A. ferox*, that of the Japanese species, and the napelline of the *A. napellus*, and from his experiments has drawn the following conclusions: 1. In similar doses aconitine of the napellus species exercises a slow local action on the sweat, but is more active and lasts longer than that caused by pilocarpine. This aconitine must be considered as the most powerful hydrotic alkaloid known. 2. The aconitine of the *ferox* species, the Japanese aconitine, and napelline exercise no local hydrotic or anti-hydrotic action. 3. If in the employment of the preparations of aconite or of aconitine of the napellus species an hydrotic action is not produced regularly, it is owing to the toxicity of this aconitine, which does not permit the administration of a sufficient dose to affect the secretions. 4. The various tinctures or extracts of the root or leaves of the *A. napellus*, which do not produce any hydrotic local effect, lead to the supposition that the dose of aconitine in these preparations is below $\frac{1}{10}$ milligramme ($\frac{1}{640}$ grain) per gramme ($15\frac{1}{2}$ grains), or else that this aconitine is so combined in these preparations as to destroy its power to act on the secretion of sweat.

Alcohol.—In a special research upon the subject, Paul Binet ¹⁹⁷_{June 20, July 20} found that alcohol, when ingested in large doses, is feebly and rapidly eliminated by the lungs. Féré ¹⁴_{July 26} has experi-
(B-1)

mentally proved that the vapors of alcohol arrest the development of the embryo in the egg of the fowl, and thinks that these results appear to sustain those observed in the case of alcoholism in man.

Aldehyde.—This substance, according to Paul Binet,¹⁹⁷ administered in large quantities, is but feebly, although rapidly, eliminated by the lungs.

Alexins.—In a series of experiments, detailed in a report to the Scientific Grants Committee of the British Medical Association, E. H. Hankin²_{Oct. 1, '92} appears to have proven that a few electric sparks of high potential are capable of robbing a pure alexin solution of its power of killing bacteria. How electricity acts in these instances is not satisfactorily explained.

Alum.—How alum acts upon the nervous system has been summarily discussed in an editorial.²_{May 6} Reference is made especially to the able experiments of Mayer and Siem, whose studies regarding the action of aluminium salts are the most complete so far published. In these experiments it was found that when administered to animals, such as dogs, cats, and rabbits, by subcutaneous injection, a soluble salt of alum causes no symptoms at all for three or four days. Then the animal experimented upon suffers from loss of appetite and obstinate constipation, emaciation, languor, and disinclination to move. Next there is vomiting and loss of sensibility, as a deep prick with a needle is scarcely felt. When forced to move, the leg is raised, but trembles and twitches violently, and is with difficulty placed on the ground. Sometimes there is general tremor or convulsive twitching and sometimes extreme weakness or partial paralysis of the posterior extremities. There is complete loss of sensibility to pain, while the animal retains its senses. Then the power of moving the tongue and of swallowing is completely lost; even the saliva cannot be swallowed. The symptoms are precisely those which are observed in a disease occurring in man, and known under the name of acute bulbar paralysis.

Ammonia.—According to Paul Binet,¹⁹⁷ who has made a special research upon the subject, the elimination of this gas by the lungs is doubtful.

Amyl Nitrite.—See Nitrites.

Antifebrin.—In doses of 0.5 gramme ($7\frac{3}{4}$ grains), antifebrin, according to the studies of J. Horbaczewski,²⁰⁴⁷_{p. 101, '92} produces a dimi-

nution of the uric acid eliminated by the urine and an increase in the number of leucocytes in the blood.

Antipyrin.—According to the researches of Lamanski and Main,¹⁴_{Jan. 29} antipyrin appears in the urine forty minutes after its ingestion by the stomach and thirty minutes after its introduction by the rectum. J. Horbaczewski²⁰⁴⁷_{p. 101, '92}⁸⁰_{Mar.} finds that antipyrin in doses of 2 grammes (31 grains) causes an increase in the number of leucocytes in the blood and a decrease in the quantity of uric acid eliminated by the urine.

In regard to the elimination of this substance, when given by the rectum, P. Kandidoff,⁵⁸⁶_{No. 13}³⁷⁸_{June 8} in a special research, has observed that it occurs from the mucous membrane of the stomach, in from one-fourth to one-half hour before taking place by the kidneys.

Apocodeine.—L. Guinard²¹¹_{May 21, June 4} contributes an interesting study of the physiological action of apocodeine. The drug is a somniferous medicament, producing sleep without previous marked excitation, and especially without provoking nausea and vomiting. The sleep is slight and fugacious; it cannot be compared to the profound narcosis caused by morphine. A dog under the influence of apocodeine can be easily awakened, the animal being apparently in a state of quiet, and not of sleep. In soporific doses it slightly modifies sensibility and the conductibility of nerves. The semi-paralysis of the hind extremities, not observed by Claude Bernard in the case of codeine, always appears after the administration of large doses of apocodeine, but is not very marked. After the elimination of the drug, which appears to be rapid, the return to full consciousness is unattended, in the animal, by the hebetude, distraction, and stupor so common under the action of morphine. Like codeine, however, apocodeine increases reflex action, and in quantities of from 0.5 to 0.6 gramme ($7\frac{3}{4}$ to $9\frac{1}{4}$ grains) per kilogramme (2 pounds) of the body-weight, causes convulsions and tetanic spasms. It is a nervine, therefore, acting primarily upon the brain. In large amounts, the convulsant actions of the drug manifest themselves secondarily, surpassing all other actions in intensity, coming on rapidly, and masking the cerebral action, especially when the drug is introduced into the system directly through the circulation. The actions of apocodeine upon the centres, under all circumstances, are not, however, very pro-

nounced; they quickly disappear without the production of consecutive untoward effects. Under toxic doses, the animal dies in violent convulsions. These general results were obtained from experiments performed upon dogs.

In continuing his study Guinard ²¹¹ July 16, 23, 30; Aug. 16 performed an elaborate series of experiments, from the results of which he has drawn the following conclusions: 1. Contrary to the view generally held at present, apocodeine is not an emetic. It is probable that when it causes nausea this is due to its being contaminated with apomorphine. 2. When an injection of from 0.002 to 0.010 or 0.048 gramme ($\frac{1}{32}$ to $\frac{1}{6}$ or $\frac{2}{3}$ grain) per kilogramme (2 pounds) of the body-weight is intra-venously introduced into a dog, there are immediately produced violent nervous effects, followed by convulsions, due apparently to a depressant action upon the brain. During this convulsant stage both the heart and the respiration become accelerated and the temperature is raised. The convulsant action of apocodeine can similarly be observed secondarily, when from 5 to 6 centigrammes ($\frac{7}{8}$ to 1 grain) per kilogramme (2 pounds) of the body-weight are ingested subcutaneously. 3. When the drug is administered hypodermatically, in doses of from 25 to 35 milligrammes ($\frac{2}{5}$ to $\frac{1}{2}$ grain) per kilogramme (2 pounds) of the animal's weight, it only produces, in the dog, a calming effect. The sleep produced resembles a physiological sleep. The animals do not show that excitement and hyperexcitability so peculiar under the influence of morphine. Apocodeine causes the same calming effects when given intra-venously in a slow manner, and well diluted. 4. The disappearance of the soporific effects is quite simple. The animal awakes, but does not show that condition of hebetude following the action of morphine. Four or five hours afterward, no traces are left of the action of apocodeine. When the calming effects or those of excitement are non-fatal, the action is ordinarily fugacious and of short duration. The drug appears to be rapidly eliminated by the kidneys. 5. Following the administration of a small dose of apocodeine, there occurs a stage of short duration in which acceleration of the heart and the respiration, accompanied with a slight rise of the arterial pressure, are noticed. On the contrary, during the sleep produced by the medicament, both the heart and the respiration are depressed, and the arterial pressure is a little below normal. The slowness

of the heart is not accompanied with modification in its rhythm. The action of the drug on the heart is of medullary origin, as shown by section of the pneumogastriacs. The diminution of the arterial pressure is due more to the slow action of the heart than to a vasomotor influence. 6. During the soporific action of apocodeine there is a reduction of the bodily temperature, varying from 1.8° to 2° C. (3.2° to 3.6° F.). This reduction is probably the result, first, of immobility and muscular rest, and, secondly, of the slow action of the heart and the respiration, the exchange of gases not taking place normally. 7. Under the influence of apocodeine there is a diminution in the intra-pulmonary and intra-organic interchange of gases, manifested, first, by a decrease of the carbonic acid and an increase of the oxygen in the expired air; and, second, by an increase of the oxygen and of the carbonic acid in the blood. This fact is analogous to that observed in regard to the hypnotic action of chloral and of morphine, and seems to point out a distinction existing between hypnotic action and anæsthetic action. 8. In all doses apocodeine produces always an hypersecretion of saliva, bile, pancreatic and enteric juices, and of that of the large majority of mucous glands. These effects are the result of a central and *not* a peripheral action on the nerves, and particularly the glands. 9. Intestinal peristalsis is considerably increased by apocodeine, due to a stimulating influence exercised on the sympathetic ganglionic centres. 10. In regard to the action of apocodeine on the nervous system, it may be said that the drug influences primarily the brain, its action extending afterward to other portions of this system. This action is depressant when the dose is moderate; depressant and afterward exciting when the dose is large, but is administered in a slow manner; and, finally, convulsant when the drug is introduced in such a manner as to be rapidly absorbed by the organism. 11. The depressant effects of apocodeine upon the spinal cord are secondary in their nature, since such effects are slowly developed in animals in which section of the cord high up has been previously made. 12. As in the case of the depressant action exercised on the medulla oblongata, which is independent of that exerted on the brain, the convulsant action of apocodeine and the disturbances which accompany it are the result of a direct influence exercised by the drug on the spinal cord. 13. The convulsant action of apocodeine is

followed by a motor and sensory paralysis of the whole nervous system, and is best observed in the case of the frog. 14. The previous administration of apocodeine, as it happens with morphine, enhances the action of an anæsthetic. 15. During the sleep produced by apocodeine the pupil is but little modified, being perhaps a little contracted. It is widely dilated during the convulsant action of the drug, especially under toxic amounts. The dilatation of the pupil is particularly marked in the cat. 16. Cats are as little susceptible to the depressant action of apocodeine upon the brain as they are to the soporific action of morphine. In these animals apocodeine acts always as an excitant, increasing markedly the secretions and causing death in tetanus. 17. The principal effects of apocodeine are analogous to those produced by codeine, but between these two drugs there exist marked differences. It may be said that codeine is less hypersecretory and less depressant, but more excitant and more dangerous, therefore, than apocodeine. This latter substance is less active than codeine, but its effects are more constant.

Arsenic.—According to the researches of P. Kandidoff, ^{586 378}
arsenic, administered by the rectum, is thrown out by the mucous ^{Apr.; June 8}
membrane of the stomach in from one-fourth to one-half hour before the beginning of the elimination by the kidneys.

Atropine.—The action of this alkaloid on the respiratory movement of air has been studied by H. C. Wood and David Cerna, ¹⁷⁸
_{p. 870, '92} in a special investigation. The experiments were performed on dogs. The authors found that the first effect of atropine was to enormously excite the respiratory function; this primary excitement was soon followed, unless the dose had been very large, by a distinct fall in the air-movement, which fall, however, was not sufficient to overcome the first rise; so that the air-movements remained for a long time distinctly above the normal point. Thus, in one experiment 5 cubic centimetres ($1\frac{1}{4}$ drachms) of a $1\frac{1}{2}$ -percent. solution of atropine increased in eight minutes the air-movement from 0.1 to 0.31, but seven minutes later the movement was 0.17, which figure was increased by a second injection of 5 cubic centimetres ($1\frac{1}{4}$ drachms) to 0.4, followed in ten minutes by a fall to 0.22. In this experiment the dog was a very large one, weighing 32 kilogrammes (64 pounds), and, although altogether 25 cubic centimetres ($6\frac{1}{2}$ drachms) of the atropine solution were

given, the air-movement at the end was nearly double what it was at the beginning. Three other experiments gave identical results. In regard to the amount of increase attained by atropine in these experiments, in the first the increase was 300 per cent.; in the second and third, 100 per cent.; and in the fourth, not quite 100 per cent. The authors also studied the antagonistic action of this drug and morphine, and found that in two experiments the atropine failed entirely to increase the respiratory movements of air in the dog under the influence of opium; and, indeed, there seemed to be a distinct decrease in the air-movement after the exhibition of the atropine. The authors believed these results difficult of explanation, but ventured the statement that it is possible that the doses of morphine employed were too large for their influence to be overcome by atropine. In their further studies of the antagonism between atropine and chloral, the authors obtained concordant results. These showed that, as in the case of the normal animal, in the chloralized dog the salts of atropine greatly increased the respiratory movement of air, the experimenters concluding, therefore, that atropine is a direct and powerful stimulant to the respiratory function.

According to the observations of J. Horbaczewski,²⁰⁴⁷_{p.101} atropine, in daily doses of 1 milligramme ($\frac{1}{64}$ grain), has produced the same effects as quinine, in lessening the number of white cells in the blood and the amount of uric acid eliminated by the kidneys. In a special research, E. Vollmer³¹⁹_{No.51,'92} ⁸⁰_{May 15} sustains the conclusions arrived at by his pupil, Henbach, in regard to the antagonism existing between morphine and atropine, particularly in reference to the respiratory function. Vollmer made eleven experiments upon dogs, injecting morphine subcutaneously, and then by a gasometer measuring the respiratory volume of the dog when under the influence of morphine. Atropine was then administered, from one to three hours after, and its effect upon the respiration measured in the same way. The investigator found that atropine had the power, in dogs under the influence of morphine, to increase the respiration quickly and decidedly. This increase occurred most quickly if atropine were sent directly to the brain, and did not reach this organ indirectly by way of the heart and lungs.

Barium.—Pilliet and Malbec¹⁴_{Dec.14,'92} have studied the toxic

properties of the salts of barium. Hypodermatic injections of the chloride of barium, in doses of 1 centigramme ($\frac{1}{6}$ grain) per kilogramme (2 pounds) of the body-weight, produce death in dogs in twenty-four hours after the administration of the drug. With smaller amounts death is more retarded, but the toxic phenomena produced in the meantime are vomiting, diarrhœa, albuminuria with hæmaturia, and convulsions preceding the fatal termination. The most prominent post-mortem lesion found is nephritis with congestion of the glomerules, hæmorrhages in the tubes, and lesions in the cells of the labyrinth. These lesions are different from those caused by mercury; they consist of a granulo-fatty infiltration of the secretory epithelium of Heidenhain. Traces of hæmoglobin are found in the cells, this hæmoglobin soon passing into the secreting cells and afterward into the urine. These histological changes explain the phenomena observed during life: albuminuria and hæmoglobinuria.

Bicarbonate of Sodium.—See Sodium.

Bromides.—P. Kandidoff ^{586 378}_{No. 13; June 8} affirms that the bromide of potassium, ingested by the rectum, begins to be eliminated by the mucous membrane of the stomach, in from one-fourth to one-half hour before the occurrence of the renal elimination.

Brucine and Strychnine.—An elaborate study of the comparative actions of brucine and strychnine has been made by Edward T. Reichert, ⁹_{Apr. 8} who draws the following interesting conclusions: 1. The minimum lethal dose of brucine for the dog, when intra-venously injected, is about 0.008 gramme ($\frac{1}{8}$ grain) to the kilogramme (2 pounds) of the body-weight, and of strychnine about 0.002 gramme ($\frac{1}{32}$ grain), the relation being 1 to 40. In the frog the minimum lethal dose of brucine is about 0.1 gramme ($1\frac{3}{4}$ grains), and of strychnine about 0.002 gramme ($\frac{1}{32}$ grain) per kilogramme (2 pounds) of the body-weight, when subcutaneously injected. 2. Doses of from 0.015 to 0.020 gramme ($\frac{1}{4}$ to $\frac{1}{8}$ grain) to the kilogramme (2 pounds), intra-venously injected, cause a condition of absolute muscular quiet, and by means of artificial respiration the animal may be kept alive in excellent general condition. 3. Quantities in excess of 0.1 gramme ($1\frac{3}{4}$ grains) to the kilogramme may be intra-venously injected in divided doses without causing death, provided that artificial respiration be employed. 4. The toxic actions of brucine and strychnine are so directed to

the motor centres in the spinal cord that the minimum fatal dose is exceedingly small, owing to the production of asphyxia or to exhaustion by the violence and persistence of the tetanic convulsions. Should artificial respiration be maintained, about five hundred times the minimum fatal dose may be injected without an immediately fatal result. 5. By a proper regulation of the size of the dose and the method of administration, the stage of excitement may be prolonged over an almost indefinite period, or may be so brief as to last for but a few seconds. 6. During the stage of excitement the following actions and effects are observed: (a) The motor disturbances and convulsions are of a spinal origin. (b) The sensory nerves and muscles are unaffected. (c) The motor nerves, after the onset and continuance of the convulsions, become depressed from overwork. (d) The pulse-rate is lessened in frequency, then increased, and finally diminished. The first effect is due to stimulation of the cardio-inhibitory apparatus, the second to its depression, and the last to a depression of the excito-motor ganglion, or automatic ganglion in the heart. (e) The arterial pressure is primarily diminished, then greatly increased, and at last diminished. The first effect is due to some obscure action on the vasomotor centres in the medulla oblongata, the rise of pressure to stimulation of the vaso-constrictor centres in the same part, and the final fall to a depression of the heart and vasomotor centres. In curarized animals the rise of pressure due to stimulation of the vasomotor centres is relatively and absolutely greater than in the non-curarized animal. (f) The respiration-rate is not specifically affected, unless it be in the nature of a decrease, or during the period of convulsions, when it may be decidedly increased. (g) The bodily temperature is increased. 7. During the stage of paralysis the following are noted: (a) The muscles are not in the least affected, unless after enormously excessive doses. (b) The sensory nerves are inexcitable to strong electric currents. (c) When the motor nerves are subjected to a powerful faradic current spasms of the muscles supplied no longer occur, although the nerves transmit impulses from the nerve-centres; irritability is lost, but conductivity remains. (d) The pulse-rate is reduced, but the height of the curves is increased, the first effect being due to a depression of the motor ganglia in the heart, and the second effect to the greater filling of the viscus with blood, and perhaps

to a direct stimulation of the heart. The cardio-inhibitory fibres are paralyzed, but no increase in the frequency of the pulse-rate is observed, owing to the predominance of the depressant action on the heart-ganglia. Stimulation of the vagi causes smaller pulse-curves and a slight increase in the frequency of the beats. (*e*) The arterial pressure is increased, unless the dose has been greatly in excess, when it is diminished. The increase is due to a stimulation of the vasomotor centres in the medulla oblongata, and the decrease to a depression of the heart and to vasomotor paralysis. The increase of pressure is greater and more persistent in curarized animals. In non-curarized animals the pressure sinks below the normal immediately after the tetanic paroxysms, but in those curarized this depression is less marked. Asphyxia and electric stimulation of a sensory nerve fail to cause a rise of pressure, as in the normal animal; on the other hand, asphyxia is always accompanied by a fall. (*f*) The hæmoglobin is in some way affected, so that it cannot be oxygenated to the normal degree, although the spectroscope reveals nothing but oxyhæmoglobin. (*g*) The temperature may be increased or decreased by brucine, but is always increased by strychnine. Cocaine is unable to cause its characteristic increase of heat-production and temperature, as in the normal animal. Apparently, both strychnine and brucine paralyze the accelerator thermogenetic centres, and leave intact the automatic thermogenetic centres. (*h*) The paralytic condition caused by brucine and strychnine closely resembles that produced by curare, but is in many ways entirely distinct. 8. The chief differences in the physiological properties of brucine and strychnine are as follow: (*a*) Brucine is less rapidly absorbed than strychnine, and, as a consequence, is less prompt in its actions. (*b*) Brucine is from forty to fifty times less powerful as a convulsant, and, therefore, proportionately less fatal. (*c*) Brucine acts relatively more powerfully on the volitional centres in the frog than as a motor excitant, with the effect, oftentimes, of causing in these animals a loss of volitional movements preceding the stage of convulsions. In mammals, however, it does not seem that either poison ever destroys volition before the appearance of convulsions. (*d*) In excessive doses brucine is more poisonous to the sensory nerves than is strychnine. (*e*) During the last stage of the poisoning the action of brucine on the bodily temperature is uncertain, while

that of strychnine is positive. Brucine is, ultimately, a stronger depressant to the heart, and after enormous doses more toxic to the muscles. 9. The green frog (*Rana esculenta*) is somewhat more susceptible to brucine than the spotted frog (*Rana temporaria*). The same difference is noted with strychnine. In conclusion, the results of this research render it obvious that the physiological actions of brucine and strychnine are essentially identical, the difference being practically solely in degree and not in kind. This, together with the fact that the convulsant action of brucine is, in the mammal, about forty times less than that of strychnine, indicates that brucine will prove not only a safer drug, but of infinitely greater value as a general therapeutic agent.

Caffeine.—The physiological action of caffeine has been recently investigated by W. Cohnstein, ¹³ ⁸⁰ _{No. 6, '92; Jan.} especially in regard to the influence of the drug upon the circulation. He formulates the following conclusions, which agree with those of the most previous observers: 1. In small doses caffeine produces an increase of the arterial pressure, while larger amounts prevent this increase. 2. The influence upon the blood-pressure is the result of the changed condition of irritability of the vasomotor centre, caused by the caffeine. 3. Caffeine has a direct action on the heart, showing itself in the pulse-frequency and wave-height, first as an irritation and then as a paralysis. 4. The heart-muscle is affected by caffeine in precisely the same manner as the skeletal muscle. 5. The action of caffeine upon the heart-muscle differs from that of helleboreine of the digitalis group. Ethoxycaffeine, according to Cohnstein, exercises no influence upon the blood-pressure. Phenoxycaffeine reduces the blood-pressure slightly, decreases the frequency of the pulse, but increases the height of the pulse-wave from four to five times the normal. Methylcaffeihydroxyd reduces the blood-pressure slightly, decreases the frequency of the pulse, but increases the height of the pulse-wave from four to five times the normal, exactly as in the case of phenoxycaffeine.

Camphor.—In a special research, Paul Binet ¹⁹⁷ _{June 20, July 20} found that camphor failed to be eliminated by the lungs.

Carbamic Acid.—The interesting experiments of Nencki and Pawlow ⁶ _{Mar. 11} regarding the effects produced on the animal economy by diverting the portal blood into the vena cava, thus stopping the supply to the liver, showed that those animals surviving the opera-

tion suffered a complete change of character, becoming troublesome and sometimes obstinate, and even dangerous. Some had clonic convulsions, followed by coma, and during this quiet condition the convulsions could be elicited by any kind of irritation. The most prominent feature of all these experiments was the presence of carbamic acid in the urine of the animals, and hence the logical inference of the authors that the liver is able, in normal conditions, to destroy the acid mentioned. The investigators then introduced carbamate of calcium or sodium into the circulation of normal animals, and the effects produced were similar to those observed in the first instance. These results would seem to indicate that carbamic acid is destroyed by the hepatic organ, that substance being changed, in physiological conditions, into urea.

Cerberin.—The properties of this new glucoside have been studied by Zotos.²⁰⁴⁹₁₉₂ The drug is extracted from a plant belonging to the *Apocynaceæ* family, probably the *Thevetia iccocoli*, a Mexican cerbera. It occurs in the form of a yellowish-white, crystalline powder, readily soluble in dilute alcohol and hot water. The author found that cerberin acted similarly to the members of the digitalis group. Hypodermatic injections did not produce abscesses, and in this it differs from digitoxin and thevetin. Instilled into the eye, cerberin caused no inflammation. Its action upon the heart was found similar to that of the digitalis group, especially when introduced subcutaneously.

Chemical Composition and Hypnotic Action, Relation between.—This subject has been investigated by A. Schneegans and J. von Mering,¹¹⁶_{July, '92}⁸⁰_{Feb.} especially in regard to alcohol as combined with fatty narcotic substances. Primary alcohols have a less narcotic action than the secondary, and these less than the tertiary alcohols. In general, alcohols have a stronger action the longer the unbranching chain of carbon atoms which they contain. In the tertiary alcohols the action is dependent upon the kind of alcohol radical combined with the tertiary carbon atoms; if only the radical methyl is present, as in trimethylcarbinol, then the action is a relatively weak one; it is greater when an ethyl enters, and increases with the number of the ethyl group combined with the tertiary carbon atoms.

Chloral.—In a series of experiments with this drug, with a special reference to its influence on the respiratory function, H. C.

Wood and David Cerna ¹⁷⁸_{p.870,'92} have shown that the reduction in the amount of inspired air produced by complete chloralization is very pronounced. In many instances the decrease of respiratory air-movement amounted to 50 per cent., and sometimes even to 75 per cent. The results which the authors have obtained are concordant, and demonstrate that in the dog chloral is a true respiratory depressant, markedly reducing the respiratory movement of air. The action of chloral upon man is evidently similar to that which it exerts upon the dog, and the authors, therefore, believe that the conclusion reached in their experiments is applicable to the human being. Harnack and Remertz ⁵⁴_{p.266} believe that chloral is decomposed in the organism, chlorine being set free, this latter producing changes in the nitrogen and sulphur combinations, but without causing an increase in the proportion of the urea eliminated. This action is independent of the hypnotic action, and only occurs after the latter has taken place.

Chloralose.—When anhydrous chloral is made to act upon glucose, chloralose is produced. This substance has been the subject of an experimental research regarding its physiological actions, by Hanriot and Richet. ¹⁴_{Feb.1} In dogs, a dose of 0.5 gramme (7½ grains) per kilogramme (2 pounds) of the body-weight is followed, in about half an hour, by sluggish movements of the animal, with an irresistible tendency to sleep. The dog is finally overcome by sleep, but this is different from that caused by chloral, since there is no disturbance of the reflexes. Left alone, the animal sleeps from five to eight hours. During the sleep a slight touch will produce active movements. Neither the arterial pressure nor the temperature is affected by the dose mentioned. Larger quantities cause death, this occurring from respiratory failure. In doses of 0.25 gramme (4 grains) per kilogramme (2 pounds) of the body-weight, the drug produces a kind of psychic blindness, but no sleep. The dog wanders about the room, running against obstacles with his head downward, and paying no attention to calls. The authors seem to have proved that chloralose acts especially upon the gray matter, the irritability of the subjacent white matter remaining intact. Thus, while the dog, under the influence of the drug, is insensible to pain, and will lie still while bloody operations are performed on the skin, muscles, and even bones, a sudden jerk of the table or floor will make him leap

violently into the air. The effects on cats are more pronounced, one-tenth of the dose used in the dog producing similar symptoms.

Chlorine.—According to the experiments of Vincent Richards, ²⁰⁶_{July, '92} chlorine is not an antidote to the venom of the cobra. If allowed to act sufficiently long upon the venom, it may possibly lessen and even destroy the poison, but it would be no better than the permanganate of potassium, which he considers less harmful than the chlorine.

Chloroform.—From a careful series of observations in regard to the administration of chloroform in the presence of a naked flame, and from confirmatory experiments, Charles Martin ⁸⁰_{Jan.} shows that chloroform, in the presence of a naked flame, decomposes with the formation of a large quantity of free hydrochloric acid. Bara-tynski ⁵⁸⁶_{Nov. 45, 46, '92}; ⁶⁷³_{Apr.} has studied the action of chloroform on the color and oxidation of the blood. From a series of experiments he concludes that the influence of the drug expresses itself on the representatives of warm-blooded and cold-blooded animals, in connection with the circulating blood in vessels, (1) by change in the color of the blood, (2) by inhibiting the oxidation of the blood, and (3) by displacement of the spectral lines of absorption on the left. On comparing these points, it must be supposed that chloroform, in the living, circulating blood in the organism, forms with hæmoglobin a stronger chemical combination than does oxygen with hæmoglobin. According to the investigations of Harnack and Remertz, ⁵⁴_{p. 265} chloroform is decomposed in the organism, as a consequence of which chlorine is liberated. This latter substance acts decidedly on the nitrogen and sulphur combinations in the organism, but does not cause an increase in the proportion of urea in the urine. These changes are produced, according to the authors, independently of the hypnotic action, and only occur after this has taken place.

The long-mooted question of the action of chloroform, particularly on the circulatory and the respiratory functions, approaches solution by the recent research of Hobart A. Hare and E. Q. Thornton. From a careful study of the experiments so far reported, from the studies made by H. C. Wood and H. A. Hare some time ago (see ANNUAL for 1891), and, finally, from their own careful series of experiments, Hare and Thornton believe that there is no real antagonism in the beliefs that the drug kills by depres-

sion of the heart or of the respiration. They assert that it practically always kills by failure of the respiration when administered by inhalation, provided that the heart is healthy and not rendered functionally incompetent by fright or violent struggles or by marked asphyxia. In excessive dose by inhalation it has a depressant effect on the circulation, chiefly due to centric vasomotor depression, with final depression of the cardiac muscle itself. Depression of the cardiac muscle alone is never great enough to cause death, but with direct depression of the circulation may do much toward producing a fatal result, for vasomotor integrity is almost as necessary to life as an intact cardiac mechanism. We cannot, therefore, totally ignore the effect on the circulation, and we cannot consider the patient in danger of circulatory failure *only* when the respiration ceases, *but as soon as it becomes abnormal*. On the other hand, even if chloroform has been given properly, the arterial pressure may be so low as to give no pulse in the radial artery, and yet the circulatory system be ready to respond at once when the drug is removed. If, therefore, the chloroform is properly administered, is there danger of its circulatory effect in man? Research on animals fails, necessarily, to give a positive reply. The variation in the action of a drug on a diseased individual from its effects on the normal one is notorious, and we have no right to dogmatically assert that there is absolutely no danger of circulatory depression in man, even if we found no evidence of failure in dogs, because there may be many idiosyncrasies or variations, through disease in the human being, which may completely reverse the results of experiments on healthy animals. In other words, supposing that the amount of depression from very full doses of chloroform equals twenty-five units, this amounts to little in the normal heart; but if the heart be depressed twenty-five additional units by disease, the depression of fifty units may be fatal, particularly if to this fifty are added twenty-five units more of depression through fright and cardiac engorgement, through disordered respiration or struggling. That true depression of the heart-muscle may take place under chloroform seems to the authors most undoubted, and they believe that the tracings in every research that they have seen support this view. There is always a decrease in the cardiac power manifested by the decrease in the force of the individual pulse-beat, and this passes away only if chloroform is removed early enough.

The authors agree with McWilliams, that from the very first inhalation of chloroform there is a constant tendency to cardiac dilatation. The authors come, finally, to the all-important questions: 1. Is chloroform a safe anæsthetic? 2. Are we to watch the pulse or respiration during the use of the drug, and what are the signs in the respiratory function indicative of danger to the patient? 3. What is the true cause of death from chloroform? 4. Is death from chloroform possible when it is properly administered? 5. Under what circumstances is the surgeon to use chloroform in preference to the less-dangerous anæsthetic—ether? 6. What is the best way of administering chloroform?

To the first question, according to the authors, the answer is Yes, for the majority of cases; provided the drug is given by one who is skilled in its use, and not only knows how to give it, but to detect signs of danger. It is not so safe as ether at any time, other things being equal, and never so safe in the hands of a tyro. To the second question is, Watch the respiration, because as soon as enough chloroform is used to endanger the circulation the respiration will show some signs of abnormality, either in depth, shallowness, or irregularity. In other words, the very effect of the drug may be to cause such deep and rapid respirations that an excessive quantity of the drug is taken into the lungs and continues to be absorbed even after the inhaler is withdrawn. As there is always a fall in pressure under chloroform, it is difficult to feel the radial or temporal pulse, and the respiratory centre recognizes the degree of arterial depression which its sister vasomotor centre has permitted by finding that its blood-supply is insufficient. As respiration fails first, it should be watched first. Finally, it is only by watching the respiration that we can tell how much chloroform the patient is getting. We do not watch this function for danger alone, but to tell us of the dose.

The answer to question three is that death is always due, in the healthy animal, to respiratory failure accompanied by circulatory depression, which latter may be severe enough to cause death, even if artificial respiration is used skillfully. Death only occurs in the healthy animal when chloroform is given in excessive quantities.

Question four the authors think it is impossible to answer for man from the basis of experimentation, as we cannot produce

diseased states in animals identical with those developed under various conditions in man. The physician having a case of heart disease should always advise the patient of the danger of any anæsthetic, and he should remember, whether it is wise to tell the patient or not, that anæsthesia always means a step toward death, even in the healthiest of men. In the event of death under chloroform, the physician is not to blame if he has taken proper precautions and given the chloroform properly. Every one is agreed that the patient taking chloroform should have plenty of fresh air, and in India it is understood that, to all intents and purposes, patients are operated on in the open air; at least, as compared to the closed rooms necessary in America and Europe. This free supply of air is important, whether we believe death to be imminent from cardiac or from respiratory failure; but this supply of air matters little to the patient if he does not breathe freely, nor does the dose of chloroform amount to aught if it is not drawn into the chest. The dose of chloroform is not the amount in the inhaler, but the amount taken into the chest, and, finally, the amount absorbed by the blood-vessels. The rapidity and depth of respiratory movements are, therefore, as Lawrie asserts, the entire key to the situation. We watch a wind-mill over a well to see if it is pumping into a reservoir a given quantity of water. If the wind-mill works irregularly, so that we know its pumping action is deranged, we separate it from the pump until it works steadily. Similarly we withdraw chloroform, as Lawrie says, whenever respiration becomes disturbed in rhythm or when struggling disturbs it, because it is the first indication that the drug's action is uncertain, and because there is no telling the dose which is absorbed. While watching the respiration will not warn us of a sudden cardiac arrest in fatty heart plus chloroform depression, neither will the pulse give us such warning, and therefore the authors are confident that the statement of the Hyderabad Commission, that the *respiration should be watched*, is correct; for the experimenters believe, from a long series of observations, that gradual cardiac failure never occurs without producing respiratory changes from the very first. In other words, Hare and Thornton do not believe that in a *healthy* heart chloroform can cause serious disorder without, as a result of beginning disorder, disturbing respiration; and, secondly, that in a healthy heart a quantity of chloroform sufficient

to disorder it will, by its direct action, disorder the respiration. If, as an extra precaution, one assistant watches the pulse while the other watches the respiration, very well; for though the respiration is the more important function to watch, the man watching the pulse might discover an irregularity which the anæsthetizer may not see reproduced in the respiratory action; but, as divided attention generally means a slighting of both objects in view, Lawrie is right, the authors believe, in insisting on the pulse being left alone.

In answer to question five, Hare and Thornton have several points to offer: 1. Hot climates (where ether is inapplicable), where a free circulation of air increases the safety of the patient. 2. Chloroform may be used whenever a large number of persons are to be rapidly anæsthetized, so that the surgeon may pass on to others and save a majority of lives, even if the drug endangers a few, as on the battle-field, where only a small bulk of anæsthetics can be carried. 3. Its employment is indicated in cases of Bright's disease requiring the surgeon's attention, owing to the fact that anæsthesia may be obtained with so little chloroform that the kidneys are not irritated; whereas ether, because of the large quantity necessarily used, would irritate these organs. Quantity for quantity, ether is, of course, the less irritant of the two. 4. In cases of aneurism, or great atheroma of the blood-vessels, where the shock from an operation without anæsthesia would be a greater danger than the use of an anæsthetic, chloroform is to be employed, since the greater struggles caused by ether and the stimulating effect which it has on the circulation and blood-pressure might cause vascular rupture. 5. In children or adults who readily have bronchitis, or who are known to bear ether badly, or, in other words, have an idiosyncrasy to that drug, chloroform may be employed. 6. Persons who struggle violently, and who are robust and strong, are in greater danger from the use of chloroform than the sickly and weak, probably because the struggles strain the heart and tend to dilate its walls. In the opinion of the authors, the safest method of administration is by Lawrie's or Esmarch's inhaler, because these provide free circulation of air and do not distract the attention of the anæsthetizer from the respiratory movement by complicated apparatus. Apparatus much like these, in allowing a free amount of air, are the

Hyderabad chloroform inhaler or open-ended cone, with Krohne's and Seseman's respiration-indicator attachment. The Junker inhaler, even with its modifications, they believe to be too complicated and cumbersome; and while the less chloroform is wasted in administering the drug, it must all be thrown out of the bottle afterward. If used at all, it should be used with the increased air-supply and respiration indicator of Krohne and Seseman. On the whole, Hare and Thornton agree with the conclusions of Lawrie.

In reply to a general request for reports of accidents under chloroform, Hare and Thornton received thirty-five answers, which included: Number of respiratory failures, 29; number reported unable to feel the pulse, while respiration continued, 4; number of simultaneous failures, 1; and number not stated, 1. Of the 29 failures of respiration, there were 5 deaths, a percentage of 17.25. Of the 4 circulatory failures there were 2 deaths, a percentage of 50. The case of arrest of respiration and circulation simultaneously resulted in death. It is interesting to note that in this summary of cases the great majority of accidents were due to respiratory failure and not to the heart, and such a failure was irrespective of age, sex, condition, or magnitude of the operation; also that the accident may occur before, during, or after the operation; and, finally, that in some instances circulatory failure takes place while respiration continues.

Gaskell and Shore,²_{v.1,p.106} from cross-circulation experiments, conclude that the fall of pressure seen under the action of chloroform is due rather to cardiac than to vasomotor depression. Lawrie,⁶_{Feb.11} refutes this statement of Gaskell and Shore, and details experiments which he believes combat those of these two latter investigators. Lawrie concludes his paper with the following statement: "The Hyderabad Commission's work proves that, while Syme's principles are right, there is no such thing as a safe method of chloroform administration. It is no longer a question of the superiority of the London method or of the Edinburgh method; absolute safety can be attained neither by watching the respiration nor the pulse for signs of danger, which are in either case proof of improper administration or of overdosing. Moreover, overdosing may take place whether the anæsthetic is given on lint, or on a towel, or on a cap such as we use, or with

Junker's or Skinner's or any other form of apparatus. The all-important point is that the breathing shall never be interfered with in any way. Safety under chloroform can unquestionably be insured, but it can only be so by attending to regular, natural breathing; and, whatever method is employed, no one can deny that it is the bounden duty of the chloroformist to maintain natural breathing throughout the whole period of administration. To maintain natural breathing requires careful training and considerable experience; but if these conditions be fulfilled it is impossible to produce anything with chloroform but anæsthesia, and the Hyderabad Commission has shown that anæsthesia alone is entirely free from risk,"—provided, as Hare and Thornton would add, that the patient is in ordinary health. These two latter authors would prefer the last sentence of Lawrie to be changed in this manner: Anæsthesia can be safely produced by chloroform.

Cimicifuga Racemosa.—I. N. Brainard, of Alma, Michigan, ⁸⁰_{June 15} took 3 drachms (12 grammes) of the fluid extract of cimicifuga, and the effects produced by the drug are by him described as follows: In about half an hour had a feeling of fullness in the head; the face was flushed; there was a sensation of warmth all over the body, with vertigo, which was increased when in the erect posture. There was considerable pain at the end of the spine. After an hour had elapsed, all these symptoms were accentuated. There was redness of the eyes, but the pupils were normal, as was also the bodily temperature. The pulse was 100 and full, and there was marked increase in the arterial tension. At no time was there any slowing of the pulse or any signs of cardiac depression. The headache now became excessively severe, and the spinal cord was apparently much stimulated. The muscles in the back, arms, and legs were hard and trembling. Two hours later these symptoms continued with increased severity, and nausea then appeared. There was increased peristalsis, but no purging. Four hours after taking the poison he drank some warm water, and vomited three times during the next five hours. The symptoms continued, nevertheless, until the eighth hour. The headache was so exceedingly severe that it was necessary for his wife to anæsthetize him with chloroform. There was a great deal of backache and restlessness. Eight hours after the drug was taken sleep came on, from which he awoke several times with marked

priapism. The effects upon the spinal cord and nerves were felt for a little over two days. There was considerable increase of bronchial secretion, but no increase in the urinary flow or in the secretion of the skin was noticed during the entire period of the paroxysm.

Cinchonibine.—See Cinchonine.

Cinchonidine.—See Cinchonine.

Cinchonifine.—See Cinchonine.

Cinchonigine.—See Cinchonine.

Cinchoniline.—See Cinchonine.

Cinchonine.—In an experimental study of the toxicity of the isomeric bodies of cinchonine, P. Langlois⁴¹⁰_{Apr.} has obtained interesting results. The author gives a table of the medium convulsant doses of these substances, per kilogramme (2 pounds) of the body-weight, as follows: Cinchonine, 0.06 gramme (1 grain); cinchonibine, 0.04 gramme ($\frac{2}{3}$ grain); cinchonidine, 0.08 gramme ($1\frac{1}{4}$ grains); cinchonifine, 0.04 gramme ($\frac{2}{3}$ grain); cinchonigine, 0.005 gramme ($\frac{1}{12}$ grain); and cinchoniline, 0.015 gramme ($\frac{1}{4}$ grain). The figures are less precise in the case of the rabbit and guinea-pig. For the last class of animals, the experimenter gives the following as the medium convulsant doses per kilogramme (2 pounds) of the body-weight also: Cinchonine, 0.40 gramme ($\frac{2}{3}$ grain); cinchonibine, 0.10 gramme ($1\frac{3}{4}$ grains); cinchonidine (not determined); cinchonifine, 0.09 gramme ($1\frac{1}{2}$ grains); cinchonigine, 0.024 gramme ($\frac{2}{5}$ grain), and cinchoniline, 0.08 gramme ($1\frac{1}{4}$ grains). In frogs the results were not very satisfactory. In these animals the author did not obtain true convulsions with the isomeric bodies of cinchonine, even after their temperature. He likewise studied the toxic action, in fishes, of three of the isomeric bodies only; that is, cinchonigine, cinchoniline, and cinchonifine. Three species of these animals were observed, the crenilabrus, or common gold-sinny, the *box salpa*, and the *anguilla*, or common eel. To these animals cinchonigine was poisonous in doses, respectively, of 0.04, 0.11, and 0.08 gramme ($\frac{2}{3}$, $1\frac{3}{4}$, and $1\frac{1}{4}$ grains); cinchoniline, 0.10, 0.14, and 0.12 gramme ($1\frac{3}{4}$, $2\frac{1}{4}$, and $1\frac{7}{8}$ grains); cinchonifine, 0.15, 0.20, and 0.12 gramme ($2\frac{1}{4}$, $3\frac{1}{4}$, and $1\frac{7}{8}$ grains).

Cocaine.—H. C. Wood and David Cerna,¹⁷⁸_{p. 870, '92} in a special investigation, have obtained concordant results with this drug regarding its influence on the respiration. The results of their experiments

have shown that cocaine in the normal animal enormously increases the amount of air-movement, the increase being usually greatest when the tetanoid convulsive movements produced by toxic doses of cocaine are marked. Under these circumstances the increase may amount to 200 per cent. or 300 per cent. Similar results were obtained with cocaine in narcotized animals, especially in those under the influence of chloral, provided this latter substance was not given in enormous amounts. The authors conclude, therefore, that cocaine acts as a powerful respiratory stimulant, whose influence, however, fails in the presence of an overwhelming dose of a respiratory depressant. V. Aducco⁷³⁹_{Apr.} does not believe in the cumulative action of cocaine. From the results of a series of experiments on dogs, he concludes that the drug is eliminated in a form distinct from its original nature. The action of the alkaloid becomes more and more marked under repeated dosage. This, however, is not due to a cumulative influence, but to a special dynamic or functional modification caused by the drug in the organism. This molecular disturbance is especially manifested in the nervous system.

Codliver-Oil.—Bonillot¹⁴_{Nov. 13, '92} has corroborated, in the case of man, the results obtained previously by Gautier and Mourges from their experiments upon the lower animals with the alkaloids of codliver-oil, which they were the first to separate from the mother-substance. The latter investigators found said alkaloids to stimulate the processes of nutrition and to produce diuresis. Bouillot administered the alkaloids by the mouth in daily doses of from 0.15 to 0.20 gramme ($2\frac{1}{4}$ to $3\frac{1}{4}$ grains), and it was observed that the daily amount of urine was increased, its density being diminished. At the same time there was also an increase in the quantity of the urea excreted. Analyses were made of the nitrogenous constituents of the urine, before and after the administration of the alkaloids, with a view to determine whether this large increase of the urea was due simply to increased production or also to a more complete oxidation of the less completely oxidized nitrogenous extractives. It was found that the incompletely oxidized nitrogenous extractives were considerably diminished after the ingestion of the alkaloids.

Copaiba.—The elimination of this substance by the lungs is, according to the investigations of Paul Binet,¹⁹⁷_{June 20, July 20} insignificant and almost *nil*.

Coriamyrtine.—Koeppen²⁷³_{p.327,'92}; ⁸⁰Feb. found this drug capable of stimulating the respiratory and circulatory centres depressed by narcotic drugs, such as chloral. It acted similarly to picrotoxin (*q. v.*).

Corrosive Sublimate.—See Mercury.

Creasote.—In studying the elimination of this substance, Paul Binet¹⁹⁷_{June, July} found that it was only feebly thrown out by the expired air, even when ingested in toxic doses. The agent was found in small quantities in the lung-tissue. Oleocreasote, which is an oleic ether of creasote, has been the subject of an elaborate pharmacological study by J. L. Prevost, who has drawn the following conclusions: 1. Creasote in oleic combination (*oleocreasote*) is tolerated in larger doses than when it is simply mixed with oil, and does not cause gastro-intestinal disturbances. 2. The toxicity of oleocreasote is much less pronounced than that of creasote simply dissolved in oil. 3. Experiments show that hypodermatic injections of oleocreasote are followed by the elimination of the drug by the urine. This elimination occurs at a later period, and lasts longer than when injections of a simple mixture of oil and creasote are made. 4. Administered by the stomach, oleocreasote is evidently absorbed and gives origin to an elimination of phenol, but to a considerably less extent than when the new drug is given in simple oily solution. The results of these experiments show that oleocreasote is much less toxic than the simple oily mixture; that it is absorbed from both the intestinal tract and the cellular tissue, and is eliminated by the urine in the form of phenols. Regarding the pulmonary elimination of oleocreasote, Paul Binet¹⁹⁷_{June, July} observed that only traces could be detected in the expired air, even when ingested in toxic amounts. Small quantities of the substance were found, however, in the lung-tissue. L. Imbert³⁴⁸_{p.783,'92}; ⁸⁰Mar. affirms that creasote is thrown out especially by the kidneys, no matter how it is administered,—whether by the mouth, subcutaneously, or by the rectum. The largest quantity is eliminated during the first twelve hours after ingestion. While the elimination by the urine is very rapid, that by the lungs is comparatively insignificant. Of the three elements of creasote,—cresol, guaiacol, and phlorol,—the guaiacol appears to be the most rapidly eliminated.

Cresol.—See Creasote.

Cubeb.—Paul Binet¹⁹⁷_{June 20, July 20} affirms that the pulmonary elimination of cubeb is either insignificant or practically wanting.

Cutaneous Revulsion, the Action of.—François Franck¹⁰⁸_{Oct. 15, '92} appears to have shown that, besides a local congestion, cutaneous revulsion produces a marked elevation of the arterial pressure consequent on a vasomotor spasm, especially of the abdominal vessels. Further experiments on the pulmonary and cerebral circulation have demonstrated that the lungs and the brain are protected from congestion by the same mechanism which influences the abdominal viscera, and that, at the same time, antiphlogosis tends to produce in them similar phenomena; that the normal heart is in great part sufficient to do the work imposed upon it under such circumstances.

Dimethylamine.—This drug has been studied by Combe-male.⁶⁷_{Mar. 30} Its formula is said to be $\text{NH}(\text{CH}_3)_2$. It is a gas soluble in water, of a strong ammoniacal odor and an exceedingly alkaline reaction. It liquefies at low temperatures, and its general properties are similar to those of monomethylamine. The results of a series of experiments with dimethylamine led the author to formulate the following conclusions: 1. Given by the stomach, in doses of from 5 to 10 centigrammes ($\frac{7}{8}$ to $1\frac{1}{4}$ grains) per kilogramme (2 pounds) of the body-weight, or in solutions of the strength of 1 to 300 or 1 to 1000, dimethylamine produces no marked effects. 2. Hypodermatically, (a) the drug acts as a powerful caustic, causing marked scars, even in solutions of the strength of 1 to 200; (b) the minimum fatal dose is 20 centigrammes ($3\frac{1}{4}$ grains) per kilogramme (2 pounds) of the body-weight; (c) the initial fall and the subsequent rise of the bodily temperature are neither constant phenomena nor proportional to the dose employed; (d) the most constant effect is an increase of the salivary secretion and of the normal alkalinity of the saliva; (e) dimethylamine is partly eliminated by the kidneys, the irritant substance excreted bringing about a congestion of these organs. The latter phenomenon is often accompanied by an intense hæmaturia or by albuminuria.

Ether.—The action of acetic ether upon the respiration and the circulation has been studied by Krautwig.³¹⁹_{Apr. 29; July 8} Large intravenous doses were dangerous. With moderate amounts the respiratory capacity was even redoubled, the maximum effect being obtained in from fifteen to thirty minutes. This effect of acetic acid increases with the dose, whereas small doses of ordinary ether increase, but large doses lessen, the respiratory capacity. Thus, ether must be used with caution in increasing doses. Ether even

paralyzes enfeebled centres more readily than sound ones. Experiments were made in which the respiratory capacity was diminished by morphine. In these instances acetic ether was of great benefit, whereas ordinary ether further diminished the respiratory capacity in two cases, and in a third, despite a temporary increase, further paralysis rapidly followed. The permanency of the stimulating effect on the respiratory centres is especially advantageous, and in this acetic ether is even better than camphor. Moderate doses had no action on the blood-pressure, and no ill effects on the heart. The author, therefore, concludes that acetic ether demands the same attention as camphor, and that it excels ether. Further trial must show whether the same is true of man as of animals. The pure drug should be given subcutaneously, beginning with $\frac{1}{2}$ cubic centimetre ($7\frac{1}{2}$ minims), increased if necessary. According to the investigations of Paul Binet,¹⁹⁷ the elimination of ether by the lungs is a very important phenomenon. In studying the action of this agent upon the incubation of the egg of the fowl, Féré¹⁴ July 26 has observed that etherization retards the development of the embryo. Similar observations have been made in the case of the human embryo.

B. Krautwig¹¹³ No. 23 has experimented upon himself with acetic ether. He employed the drug subcutaneously and by the rectum. For fourteen days he took as many as 40 drops daily in a little water. Only an agreeable sensation of warmth in the stomach was produced. An injection of 0.3 cubic centimetre ($4\frac{1}{2}$ minims) into his back caused a slight pain, which soon disappeared; while a similar injection of sulphuric ether produced great pain, this lasting over fifteen minutes. The author has found that acetic ether, in moderate doses, increases the volume of the respiration, this effect lasting from a quarter to half an hour, and then disappearing slowly. The amount required to excite the respiratory function does not affect the heart, and acetic ether is innocuous even when introduced directly into the circulation. It forms no thrombi, nor does it exercise any deleterious influence on the blood-corpuscles. The author concludes that, as a respiratory stimulant, acetic ether far surpasses sulphuric ether.

Ethoxycaffeine.—See Caffeine.

Ethyl Bromide.—The action of this drug has been investigated by L. Guinzbourg,⁵⁸⁶ No. 31, '92; ⁸⁰ May his experiments having been made

on dogs and rabbits. The author divided his experiments into three series. In the first series the animals were allowed to breathe freely in an atmosphere charged with the bromide of ethyl, in the second series a mixture of air and bromide of ethyl was insufflated into the lungs of the animals, and in the third series the drug was administered intra-venously in the form of emulsion. The general results were as follow: The inhalation of small quantities of ethyl bromide produced narcotic effects, without any changes in the arterial pressure, although the pulse was accelerated, but regular. Larger amounts caused from the start a diminution of the blood-pressure, accompanied with an irregularity of the cardiac beats; but such a diminution was of short duration. Still larger quantities of the drug produced a lowering of the arterial pressure, followed by an elevation of short duration; the diminution was again accompanied with disturbances of the pulse. With the elevation of the pressure, however, the cardiac pulsations became regular. Very large amounts of the vapor of the bromide of ethyl caused from the beginning a fall of the pressure, followed by an insignificant rise. In these instances their regularity of the heart's action was quite marked. The drug, in small doses, produces an increase of the pulse-rate by an action on the cardio-motor ganglia or on the accelerator nerves; the slowness of the pulse, after large doses, being attributed to a diminution of muscular irritability of the heart. The diminution of the arterial pressure depends on a paralysis of the peripheral vasomotor constrictor system. Bromide of ethyl does not influence the vagi nor the central vasomotor dilator system; neither is there much action exercised on the peripheral vasomotor dilator nerves. The results of these experiments have led the author to conclude that the narcotic effects can be obtained from the bromide of ethyl without causing changes in the blood-pressure; that toxic doses of the drug produce arrest of the respiration before that of the heart, and that disturbances of cardiac action are also induced; that, therefore, in administering the bromide of ethyl the same precautions should be taken as in administering chloroform. The anæsthesia by bromide of ethyl is rapidly produced, but it likewise passes off quickly.

Ethyl Theobromine.—According to the experiments of W. Cohnstein,^{13 80} ethyl theobromine kills warm-blooded animals, with partly clonic and partly tonic convulsions proceeding from the
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brain, the occurrence of which can be prevented by the use of artificial respiration. Under toxic doses the arterial pressure sinks gradually. Death follows, with symptoms of paralysis of the spinal cord and the medulla oblongata.

Eucalyptol.—Paul Binet¹⁹⁷_{June} observed that this drug was rapidly eliminated by the lungs, but that only traces of it could be detected in the expired air.

Europhen.—Christman⁵⁰_{V.13, No.8}; ¹⁸⁵_{Aug.} has studied the influence exercised by europhen upon the tubercle bacilli. In his experiments the author employed pure cultures of the bacillus, and also the organisms found in tuberculous sputa. The europhen was either directly dusted on the cultures or placed in a short reagent-glass and suspended in the hermetically-closed culture-glass, or employed in the form of a concentrated solution in olive-oil. The animals employed were exclusively guinea-pigs, and the injections were usually made intra-peritoneally. In the *first series* of experiments a culture seventy days old was dusted with europhen and placed in a thermostat at a temperature of 33° C. (91.4° F.). Five guinea-pigs were inoculated. Inoculation with culture subjected to the action of europhen for respectively seven and fourteen days caused death in ninety-three and one hundred and sixty days; the autopsy in the first animal revealing numerous bacilli, and in the second only a few scattered ones in the glands. The animals inoculated with culture acted upon by europhen for twenty-one, twenty-eight, and thirty-seven days, respectively, showed, at the autopsy, no signs of tubercle or bacilli. In the *second series* of experiments a culture fifty days old was exposed to the action of europhen-vapor as described above, and four animals were inoculated after an exposure of thirteen, twenty-seven, thirty-six, and forty-four days, respectively. The first of the four showed no signs of tuberculosis at the autopsy except three swollen mesenteric glands; the others, no tuberculous lesions of any kind. In the *third series* a culture fifty-nine days old was scraped off and rubbed together with a concentrated solution of europhen in olive-oil and allowed to remain in the dark at the temperature of the room. Before the inoculation it was stirred with a glass rod and injected in quantity of one cubic centimetre. The inoculations were made after an exposure of the culture to the action of europhen-oil, varying from twenty-four to twenty-five days. The

animal inoculated with the culture exposed for four days was killed one hundred and sixty days later. The others died after a period of from one hundred and three to one hundred and thirty-five days; all presented marked tuberculous lesions. In a *fourth series* of experiments the influence of europphen upon tuberculous sputa was tested by rolling the infected sputa in quantities of $\frac{1}{2}$ centimetre ($\frac{1}{12}$ minim) in the powder until it was completely covered. The sputa thus treated were placed in two hermetically closed jars, the one specimen (*a*) being kept at the temperature of the room, and the other (*b*) at 33° C. (91.4° F.). The control guinea-pig died twenty-eight days after peritoneal inoculation, with marked tuberculous lesions. Three guinea-pigs were inoculated with material from specimen (*a*) after exposure of the sputa to the action of europphen for a period of seventeen days, thirty-one and thirty-seven days respectively. Of these the first died in forty-seven days, with marked tuberculous changes; the other two died in thirty-one and twenty-two days, respectively, of enteritis, no tuberculosis being present. Two animals were inoculated with sputa from specimen (*b*) after exposure to the action of europphen for twenty-six and thirty-seven days, respectively, and presented no evidences of tuberculosis three or four weeks later. It will be observed that europphen dissolved in oil did not prevent the noxious action of the tuberculous bacilli. The author, therefore, arrives at the conclusion (and the results of his experiments support it) that europphen acts as a powerful germicide, provided the conditions are favorable to its decomposition; that is, to the separation of iodine.

Fats, Assimilation of.—Victor I. Menschoff⁵⁸⁶_{No. 11}, ²⁶_{June 1} has made an interesting investigation regarding the assimilation of fats in old people. The observations were conducted on seven healthy men, aged from 70 to 88 years. In each instance the experiment was divided into three stages of equal length, during the first of which the subject was daily ingesting 100 grammes (3½ ounces) of meat, 600 grammes (19 ounces) of white bread, 30 grammes (1 ounce) of butter, 60 grammes (2 ounces) of sugar, 3 grammes (46 grains) of common salt, 500 cubic centimetres (1 pint) of milk, and 1500 cubic centimetres (3 pints) of tea. During the second period he was given 120 grammes (4 ounces) of meat a day, while in other particulars the diet remained the same as in the initial stage.

During the third period the subject's daily diet consisted of 400 grammes ($12\frac{3}{4}$ ounces) of white bread, 400 grammes ($12\frac{3}{4}$ ounces) of potatoes, 120 grammes (4 ounces) of butter, 60 grammes (2 ounces) of sugar, 3 grammes (46 grains) of salt, 500 cubic centimetres (1 pint) of broth, and 1500 cubic centimetres (3 pints) of tea. The general results obtained are summarized as follows: 1. During the first period, when the total daily quantity of ingested fats amounted to 58.017 grammes ($1\frac{3}{4}$ ounces), on an average (varying from 51.87 to 63.86 grammes—1 to 2 ounces), the assimilation of fat averaged 94.93 per cent. (oscillating between 91.62 and 97.74 per cent.). 2. During the second period, when the total daily quantity of ingested fat amounted, on an average, to 128.72 grammes (4 ounces),—varying from 122.87 to 137.21 grammes ($3\frac{3}{4}$ to $4\frac{1}{2}$ ounces), or was 70.71 per cent. greater than in the preceding stage,—the assimilation of fat averaged 97.49 per cent. (varying between 96.11 and 99.05 per cent.). In other words, it increased 2.57 per cent. in comparison with the first period. 3. During the third period, when the diet included some comparatively less digestible articles, and when the subject was ingesting, on an average, 103.04 grammes ($3\frac{1}{10}$ ounces) of fats daily (or 22.47 grammes— $5\frac{3}{4}$ drachms—less than the second stage, and 48.23 grammes— $1\frac{1}{2}$ ounces—more than in the first stage), the assimilation averaged 96.20 per cent. (varying from 92.23 to 98.62 per cent.), or was 1.29 per cent. better than in the second period, but 1.28 per cent. greater than in the first. 4. The subject's bodily weight increased in four cases during the experiment, the surplus averaging 2362 grammes ($75\frac{1}{2}$ ounces), while in two it decreased, the loss averaging 1137 grammes ($36\frac{1}{2}$ ounces). 5. According to the researches of Russian authors, in healthy subjects, aged from 18 to 35, and ingesting, on an average, 95.99 grammes ($3\frac{1}{4}$ ounces)—from 40.01 to 176.43 grammes ($1\frac{1}{4}$ to $5\frac{1}{2}$ ounces)—of fats daily, the assimilation of fats averaged 95.5 per cent. (varying between 88.27 and 98.72 per cent.). Confronting the figures with the afore-given, the conclusion is justified that in the aged the assimilation of food-fats is by no means inferior to that in persons in flourishing age; on the contrary, it seems to be even superior.

Fluoride of Sodium.—See Sodium.

Formic Aldehyde.—See Formol.

Formol.—In a study of the properties of formol, also known as formic aldehyde, F. Berlioz and A. Trillat⁵⁵_{Oct. 15, '92} gave the following conclusions: (1) the vapors of formol are rapidly diffused in the normal tissues, and render these insusceptible to putrefaction; (2) in small amounts the vapors prevent the development of bacteria and other organisms; (3) they sterilize in a few minutes substances impregnated with the bacillus of Eberth or carbuncle; (4) the vapors are not toxic unless they are breathed for several hours and in large quantities.

Gelsemine.—In a special investigation of the actions of the active principles of gelsemium Arthur R. Cushny²⁷³_{V. 31, '92} obtained the following general results: Gelsemine was found to be very active. In the frog 10 milligrammes ($\frac{1}{6}$ grain) produced symptoms of poisoning, especially upon the *Rana temporaria*. The prominent symptom was a marked hyperexcitability of the reflexes, occurring in from one to two hours after the injection of the drug into the abdominal lymphatic sac. This effect persisted for eighty hours. In large doses gelsemine paralyzes, like curarine, the terminal nerve-filaments or plates in the muscles. Analogy would lead to the placing of gelsemine under the same group with strychnine. Amorphous gelsemine was found to be still more poisonous. One milligramme ($\frac{1}{64}$ grain) was sufficient to produce in the frog a slight narcosis. Reflex action was much diminished. A special symptom observed was tremor of the head and the anterior part of the body, this tremor lasting from one to two seconds after the animal was irritated mechanically. With from 2 to 3 milligrammes ($\frac{1}{32}$ to $\frac{1}{22}$ grain) the respiration was arrested, and 5 milligrammes ($\frac{1}{12}$ grain) were sure to cause death. Upon warm-blooded animals gelsemine acted also very energetically. The lethal dose in the rabbit was 1 milligramme per kilogramme (2 pounds) of the animal's weight. The symptoms were similar to those produced in the frog, and consisted in a descending paralysis of the central nervous system. The author holds that the action of gelsemine may be compared to that of conicine.

Guaiacol.—With regard to the pulmonary elimination of guaiacol, Paul Binet¹⁹⁷_{June, July} found that, even when ingested in toxic quantities, the drug was but slightly thrown out by the expired air. Small amounts of the drug, however, were met with in the lung-tissue.

Heat, Influence of, on Respiration.—According to the experimental studies of H. C. Wood and David Cerna¹⁷⁸_{p. 270, '92} heat is a most powerful stimulant to the respiratory centres. In normal animals, as well as in those under the full influence of narcotic drugs, it acts as a stimulant to the respiratory centres. These results seem to demonstrate the way in which heat protracts or even saves life during narcotism, and to enforce the necessity, by the various means, of overheating the human body when respiratory paralysis from the action of some narcotic agent is threatened.

Hydrazine.—From an experimental investigation of the physiological actions of hydrazine, C. Lazzaro⁵⁸⁹_{Mar. 26} has arrived at the following conclusions: In mammals the drug causes epileptiform convulsions similar to those produced by ammonia, and are accompanied by dilatation of the pupil and vomiting. The convulsions are of central origin, and are dependent upon an action on the bulbo-cerebral mass. No influence is apparently exercised on the spinal cord. Mydriasis is produced by excitation of the sympathetic fibres. Whether the drug is given subcutaneously or intra-venously, vomiting is produced, and it would seem that such phenomenon is of centric origin; but it is possible also that the drug irritates the peripheral vagi in the stomach, causing emesis by a reflex mechanism. On the arterial pressure hydrazine exercises no important action. To produce convulsions a dose of from 10 to 12 centigrammes ($1\frac{3}{4}$ to $1\frac{7}{8}$ grains) of hydrazine per kilogramme (2 pounds) of the body-weight is required; to cause emesis quantities of 2 centigrammes ($\frac{1}{8}$ grain) per kilogramme (2 pounds) of the body-weight are sufficient.

Hydrogen.—P. Binet,¹⁹⁷_{June, July} has shown that sulphuretted hydrogen, however ingested, is feebly but rapidly eliminated by the lungs.

Iodides.—An interesting study of the effects of the iodides on arterial tension and the excretion of the urates has been published by A. Haig.²_{Jan. 14} The author refers, in the first place, to one of the laws governing the excretion of urates and water as formulated by him some time ago; that is, “that, *cæteris paribus*, arterial tension varies with the uric acid that is circulating in the blood.” According to his observations, some twenty drugs, or rather groups of drugs, all diminished the excretion of uric acid in the urine, and at the time they did this produced also relaxed arterioles, lowered arterial tension, and diuresis. Iodides could be classed

with these drugs, and as the latter could further be broken up into three groups, according to the way in which they produced the diminished excretion of uric acid, it might be possible to say which of the groups the iodides most resembled in their mode of action. He pointed out how this action of iodides on the solubility of the urates, and so on the contraction of the arterioles, enabled us to explain all their most important effects in physiology and pathology, just as he had previously pointed out in the case of opium and mercury. He referred, lastly, to his previous observations on uric acid as a cause of high arterial tension, and suggested that there was no possible explanation of the parallel action of all these drugs, except that which he had given, namely, that the urates contracted the arterioles all over the body, and raised arterial tension, while their absence from the blood-stream, however produced, allowed these to dilate. The action of iodides on arterial tension was thus completely explained by their influence on the solubility and excretion of urates. P. Kandidoff⁵⁸⁸_{Apr.} has observed that the iodide of potassium, ingested by the rectum, is eliminated by the stomach, this elimination beginning from one-fourth to one-half hour before that occurring by the kidneys. Paul Binet¹⁹⁷_{June, July} believes, from the results obtained in a special investigation, that iodine is not eliminated by the lungs. Lemanski and Main¹⁴_{Jan. 29} have detected iodide of potassium in the saliva in about fifteen minutes after its administration by the mouth, and in ten minutes after its introduction through the rectum.

Kola.—Edouard Heckel³⁶²_{Oct. 10, '92}⁸⁰_{Feb.} has investigated the physiological actions of kola and caffeine, particularly on the muscular system. The results obtained showed that the action of caffeine was of short duration, and the amplitude of the contractions quite limited under its influence. With the powder of kola the duration of the contractions was more prolonged and the amplitude of these larger and stronger, their diminution being regularly progressive. With the *kola rouge*, or *kolanine*, the amplitude of the contractions was better still, and their diminution took place more slowly; a suspended scale showed a more lengthened conservation of muscular energy. The author concludes, in corroboration of the previous experiments of Dubois and Marie, that the stimulating influence is due to the kolanine, or *kola rouge*, in which the total amount of caffeine mixed in it is in a nascent state. (See Caffeine.)

Liquids, Non-toxic, Action of.—Chéron ¹⁴_{Aug.30} has made a series of observations on the action of hypodermatic injections of non-toxic liquids on the circulatory system. Doses of 5 grammes (1½ drachms) always produced an increase of myocardiac energy and an elevation of the arterial pressure. He has obtained the best results from an artificial serum composed of the following ingredients: Sulphate of sodium, 8 grammes (2 drachms); phosphate of sodium, 4 grammes (1 drachm); chloride of sodium, 2 grammes (31 grains); phenic acid, 1 gramme (15½ grains); distilled water, 100 grammes (3½ ounces). In an individual in whom the arterial tension had descended 9 or 10 centimetres of mercury, the injections of the fluid produced an increase of 5 to 6 centimetres. The heart-sounds were at the same time improved, and the heart-impulse became quite strong. These results persisted for several hours afterward, and sometimes for several days.

Malleine.—Like tuberculin from the tubercle bacillus, malleine is a product elaborated from the bacillus of glanders, and appears to possess a decided diagnostic value in that disease. N. Stepanoff ⁵⁸⁶_{No.15} studied its effects in animals suffering from the disease referred to. The dose employed, hypodermatically, was 1 cubic centimetre (15½ minims) of malleine. He observed the following results: (1) eight hours after the injection a general reaction occurred, and the temperature was elevated 1½ degrees; (2) there were pain and an area of redness produced at the point of injection; (3) the appetite was destroyed. Contrary to the experience of Helmann and Hendrick, Stepanoff never observed an aggravation of the disease following the injections, nor a conversion of the chronic into an acute attack of glanders. In a healthy horse malleine produced neither a general nor a local reaction.

Menthol.—According to the observations of Paul Binet, ¹⁹⁷_{June, July} menthol is not eliminated by the lungs.

Mercury.—E. Maurel ⁶⁷_{Mar.15} has found that the bichloride, in high toxic doses, exercises a noxious influence on both the white and red cells of the blood. In small amounts it affects the white corpuscles more markedly than the red bodies. The minimum fatal quantities for the organism correspond to the smallest amounts necessary to destroy the leucocytes; the same relation exists in regard to the largest quantities tolerated by the economy and those which are borne by the leucocytes; and it can be said,

therefore, that at present there is no histological element so susceptible to the influence of the drug in question as human leucocytes. The results of previous studies have led the author to believe that the action of corrosive sublimate plays a more or less important rôle in poisoning by this agent.

Methylcaffeine.—See Caffeine.

Methylene Blue.—According to Lemanski and Main,¹⁴ this drug can be detected in the saliva forty minutes after its introduction by the mouth, and in one hour and fifteen minutes after its administration by the rectum.

Methyl Mercaptan.—Methyl mercaptan is a product of the decomposition of albumen or albuminoid matters; it is found in the large intestine as a result of normal digestion, and under certain conditions it may accumulate there in large quantities. At a normal air temperature it is a putrid-smelling gas, but when compressed it is a colorless liquid, highly refractive. A study of the physiological action of this substance, both in the gaseous form and as a watery solution, has been made by L. de Rekowsky,¹¹⁰¹ on guinea-pigs, mice, and rabbits, his conclusions being as follow: 1. Compared with sulphuretted hydrogen, the action of which was studied by Lehman and Ouchinsky, methyl mercaptan is less poisonous. With the former 14 to 18 milligrammes ($\frac{9}{40}$ to $\frac{7}{4}$ grain) in solution, injected under the skin, produce serious symptoms in the rabbit, but it requires a dose of 20 to 25 milligrammes ($\frac{1}{3}$ to $\frac{2}{5}$ grain) to produce death with certainty. With methyl mercaptan doses of 33 milligrammes ($\frac{1}{2}$ grain) are required to produce serious symptoms, but a fatal result requires as large a dose as 169 milligrammes ($2\frac{1}{2}$ grains). 2. Inspiration of the gas produces first an irritation of the respiratory centre, increasing the rapidity of the respirations, as a result of which the poison rapidly accumulates in the blood. The respiratory centres become finally paralyzed from overstimulation. 3. During this time the peripheral nerves and muscles are but little affected, as may be seen by the fact that the reflexes remain good throughout the experiment. The heart also goes on beating after the respiration has ceased. Ouchinsky also noted the same fact in the case of sulphuretted hydrogen. 4. Exactly the same phenomena of poisoning take place if the gas be given either *per os*, *per rectum*, or subcutaneously. 5. The urine of the poisoned animals smelled feebly of methyl

mercaptan. 6. The blood showed no characteristic changes. It was venous, and gave the spectrum of reduced hæmoglobin, with its characteristic absorption bands. After the blood had been exposed to the air, its venous characters were lost, showing that no change had taken place.

Monomethylamine.—This body is represented by the formula of $\text{NH}(\text{CH}_3)$. It is a gas which at a few degrees below zero liquefies, has an ammoniacal odor and a strong alkaline reaction. At 12°C . (52.5°F .) a volume of water dissolves 1150 volumes of the gas; at 25°C . (77°F .), 960. The aqueous solution possesses the odor of the gas, this disappearing entirely on boiling the solution. Combemale⁶⁷_{Mar.30} has studied its physiological actions. From experiments performed on six dogs and a guinea-pig interesting results were obtained. The drug was administered once by the stomach, but was usually given hypodermatically. The fatal dose was found to be from 10 to 15 cubic centimetres ($2\frac{1}{2}$ to 4 drachms) per kilogramme (2 pounds) of the body-weight. Death took place, in these instances, in from twenty-four to forty-eight hours, and was usually preceded by hæmaturia. Five centimetres of monomethylamine per kilogramme of the body-weight proved fatal to a dog, but this animal had been used for previous similar experiments. Excessive congestion of the kidneys and the liver (less marked in the latter) was the most constant post-mortem lesion found. Hæmorrhagic points were noticed all along the small intestine, especially in the neighborhood of Peyer's patches. The valves of the heart were reddened as if an endocarditis had previously existed; infarcts were also observed in the lungs. The brain presented a pale appearance. The author reached the following conclusions: 1. Locally, monomethylamine is a powerful irritant, producing tissue necrosis. 2. On the general economy the drug produces bloody extravasations in the kidneys, liver, heart, and intestines, this general action being accompanied by variations of the central temperature, and more or less by sialorrhœa and albuminuria. 3. To obtain the local effects described, a 1-to-250 solution was required; for the general action the dose was below 10 centigrammes ($1\frac{3}{4}$ grains) per kilogramme (2 pounds) of the body-weight; a higher quantity was sure to cause death.

Morphine.—From a preliminary experimental study of the action of morphine on the respiration of the dog, W. C. Cald-

well ⁷⁷⁹_{Nov., '92} arrives at the following conclusions: 1. Morphine in small or large doses causes the breathing to become faster and shallower. 2. The higher the temperature of the room, the faster the breathing. When the thermometer is near 90° F. (32.2° C.) the breathing remains fast while the drug acts, but when about 75° F. (23.9° C.) it becomes rapid, though not as rapid as at higher temperature, and remains rapid only a short time. 3. Morphine is not very toxic to the dog. In one experiment 17 grains (1.11 grammes) were taken by the animal without any serious symptoms. To a number of other dogs 12 grains (0.78 gramme) were given hypodermatically, with no ill effects. When 60 grains (4 grammes) were administered, it did not seem to kill by depressing respiration, but rather, like strychnine, by stimulating respiration. How this drug acts to produce the phenomena referred to was not determined, but, from the results of several experiments, the author is led to believe that morphine stimulates the vagi and depresses the centre, although the results of other similar experiments would lead to precisely opposite conclusions. These differences the author is inclined to attribute to the temperature. Regarding the stimulating effects of morphine on the respiration, the results appear to corroborate those of recent investigators. It is so generally held that this agent acts chiefly as a respiratory depressant that the subject certainly needs further investigation.

To a certain extent corroborative of those of Caldwell are some of the results obtained by H. C. Wood and David Cerna ¹⁷⁸_{p. 870, '92} in a special research regarding the influence exercised by morphine on the respiration. These latter authors, however, found the drug to act more as a depressant than as a stimulant to the respiration. Indeed, they found, in almost all their experiments, that the first injection of morphine into the jugular vein, even if the quantity employed were not very large, produced an immediate arrest of respiration so severe and so permanent that, in order to save the animal, artificial respiration had to be resorted to. After the first injection enormous amounts of the alkaloid were tolerated with comparatively light effect. Immediately after recovery from the first injection the respiratory movement of the air was usually greatly reduced, but if the experiment were continued respiration often recovered itself, and, though enormous quantities of the drug had been employed and coma produced, the air-movement very

often finally became almost or altogether equal to the normal. Thus, in one experiment, a dog weighing $15\frac{1}{2}$ kilogrammes (31 pounds) took 50 cubic centimetres ($1\frac{1}{2}$ ounces) of a 5-per-cent. solution of morphine, equal to about 37 grains (2.4 grammes) of the alkaloid; yet at the end of the experiment the air-movement and the rate of respiration were practically what they had been in the beginning. In another experiment a dog weighing 7.5 kilogrammes (15 pounds) took 18 cubic centimetres ($4\frac{3}{4}$ drachms) without distinct change in the air-movement. In all these experiments in which, after a very large dose of morphine, the increase took place in the respiratory movements, the reflexes were markedly increased, and often violent convulsive movements were present. As is well known, morphine has, in the lower animals, a marked stimulating influence upon the spinal cord; and as in their experiments the increase of the respiratory movement of air late in the morphine poisoning was always associated with distinct evidences of spinal excitement, the authors believe that it is probable that the increased respiration was dependent upon or connected with this spinal excitement. The action of morphine upon the respiratory function in the dog still remaining uncertain, it is very difficult, if not impossible, the authors hold, to apply the results which have been obtained with dogs to the study of the action of the drug upon the respiratory function in the case of man.

The action on the gastric secretion has been studied by Hitzig,⁷⁵ especially in regard to its influence on the hydrochloric acid, in the case of a patient who was accustomed to use 2 grammes (31 grains) of the alkaloid daily with an equal amount of cocaine. A treatment by gradual reduction of the alkaloid showed that the amount of gastric juice quickly increased, but no free hydrochloric acid was found until the morphine had been entirely discontinued. The same author has noticed similar results in the dog. An hypodermatic injection of morphine in the animal was followed by a great reduction in the amount of gastric juice, and especially of its hydrochloric acid, while a large portion of the alkaloid was being excreted by the stomach.

It is believed by Rosenthal³¹⁹ that morphine accumulates in the system, from the fact that in patients who had been receiving 0.01 gramme ($\frac{1}{5}$ grain) a day the reaction of the drug in the saliva appeared after three or four days, and again disappeared

in two or three days. In the same patients it was found that the reaction of the alkaloid was more striking in the contents of the stomach than in the saliva. Since the saliva is more easily obtained than the stomach contents, the presence of morphine in that fluid may, as suggested by the author, be of medico-legal value. How soon the drug is found in the saliva, after its administration, remains as yet undetermined.

Guinard¹⁴_{Mar.} affirms that morphine exercises no cerebral action on the goat. This animal in a healthy condition can easily tolerate from 0.25 to 0.30 gramme (4 to 4½ grains) of the drug per kilogramme (2 pounds) of the body-weight, injected at intervals of from three or four hours. The results of calculation show that 0.0003 gramme ($\frac{1}{2000}$ grain) per kilogramme (2 pounds) of the body-weight is sufficient to produce narcosis in man. Attention is called by Edward T. Reichert¹¹²_{Apr.} to the aberrant effects occasionally produced by morphine. It is generally held that the drug is a respiratory depressant; yet he has noticed that, in the case of dogs, the action of the medicament has been that of a strong respiratory stimulant. This action is sometimes not only very marked, but equally persistent. In an experiment made upon a dog weighing 10 kilogrammes (20 pounds), the first injection of 0.12 gramme ($1\frac{7}{8}$ grains) increased the rate from 56 to 120, which was followed in a short time by a reduction to 18, but was again followed by an increase, until at the end of the twentieth minute the respirations reached the enormous number of 228 per minute. The same observations have been made by other investigators, but no explanation has as yet been offered for this deviation of morphine from its usual action as a depressant to the respiration, except by idiosyncrasies in the lower animals, which must exist as they do in man.

E. Vollmer,³¹⁹_{No. 51, '92} in criticising the experiments of Orłowski in regard to the antagonism of this drug and atropine, maintains that it is antagonized by the latter remedy.

Nicotine.—In a special research on the action of this substance on the animal organism, Graziani⁵⁸⁹_{Apr. 24; July 8} has found congestion of all the organs except the lungs. These were generally in an anæmic condition. Examination under the microscope, however, showed some destruction of epithelium in the pulmonary alveoli, accompanied, in some instances, with infarctions and hæmorrhages. The hepatic cells were broken and cloudy. A marked

nephritis was revealed in the kidneys. All these changes were observed in animals poisoned with the alcoholic extract of the alkaloid. For the detection of nicotine in the tissues themselves, the same author has applied the following method, with good results: The fresh tissue is imbedded in gum; then thin sections are cut and freed from the gum by soaking in water, and placing them afterward for a few minutes in a dilute solution of sulphuric acid, 3 drops in 50 cubic centimetres ($1\frac{1}{2}$ ounces). The sections are then treated with a solution made up of 1 part of hydriodic acid, 3 parts of iodide of potassium, and 72 parts of water. The sections are mounted in a drop of this solution. After about an hour the crystals of the reagent, with the nicotine, can be detected under the microscope. According to Morat, ^{Feb. 14} nicotine, like certain other alkaloids, exercises an influence on the soluble ferments. For instance, if it is mixed with invertin, this latter loses its power of acting on the sugars. The same results are obtained when nicotine is mixed with amygdaline, emulsine, and other similar substances. When it is remembered that nicotine acts upon the nervous system by producing a progressive paralysis, it may be inferred that its influence on the soluble ferments is of the same nature, paralyzing without destroying them.

Nitrite of Amyl.—See Nitrites.

Nitrite of Sodium.—See Nitrites.

Nitrites.—D. I. Leech, ^{June 24, July 1, 8} in his Croonian lectures, discusses the point as to whether the nitrogen present, especially in the groups formed by oxygen and nitrogen, acted as a triad or a pentad. The chief action of the nitrites is on muscular tissue; especially do the involuntary muscles and the heart react even to small doses of the nitrites, these impairing particularly the contractile power. The nitrites act as a slight depressant on the nervous system. The author has never noticed any narcotic influence exercised by medicinal doses. The most important action of the nitrites on the circulation is the reduction of the arterial pressure. Experimental evidence shows that the action is mainly exercised on the peripheral vessels. The vasomotor centres are not influenced. The nitrites accelerate the pulse, this being accompanied with an increase in force; but this force is only apparent, experiments showing that even small quantities of a nitrite weaken the cardiac pulsations. According to the author, the

influence of the nitrite of amyl on the pulse begins a few seconds after inhalation; the arterial tension is lowered to the utmost point in from forty to sixty seconds, remains extremely low for thirty seconds, then rises suddenly, and a minute and a half afterward is only a little lower than it was before the inhalation. A small dose of sodium nitrite (2 grains—0.13 gramme) distinctly affects the pulse in from two to three minutes; the point of the lowest tension is reached in from eight to twenty minutes, and any noticeable influence ceases in from two to three hours. Slowness and irregularity of the pulse, with slight intermissions, are sometimes observed, but these irregularities become less, or entirely disappear, soon after the administration of the drug. It is interesting to note that the nitrites, in very small amounts, affect the circulation. Thus, for instance, $\frac{1}{16}$ grain (0.004 gramme) will produce a marked action in most people. Experimental evidence appears to have shown that under the influence of the nitrites the lungs are temporarily dilated, the work of the right heart being thus relieved to a certain extent. Again, according to the author, they do not markedly influence the function of the kidneys, there being no alteration in the flow of urine, notwithstanding that the renal vessels are dilated. Neither do they exercise any noticeable influence on the temperature, except when given in toxic amounts. The organic nitrates and the nitrites possess similar properties, this being due, according to the author, to the probable conversion of the nitrate molecule into the nitrite molecule.

Nitrogen.—In order to elucidate, as far as possible, the nitrogenous metamorphosis and assimilation in healthy old people Nicholas N. Guryeff ⁵⁸⁶ _{No. 24, '92; June 1} ²⁶ has instituted a special series of experiments. Five men, aged from 65 to 88, were selected for the purpose. Each subject was given daily 90 grammes (3 ounces) of proteids, 42 grammes ($1\frac{1}{2}$ ounces) of fat, and 372 grammes (12 ounces) of carbohydrates. The following conclusions are drawn by the author: 1. In the old the assimilation of nitrogen averages 91.15 per cent., or is only 3 per cent. lower than in healthy young men, since G. I. Jaweis's researches ²⁰⁵¹ _{'91} have shown that the assimilation in non-working young men amounts, on an average, to 94 per cent. 2. The nitrogenous metamorphosis, however, averages only 80.37 per cent. (oscillating between 90 and 66 per cent.); that is,

is considerably lowered in comparison with young people. In other words, in the aged a large proportion of ingested proteids does not take any active part in the general course of tissue-metabolism. 3. In the old the proportion of underoxidized nitrogenous products in the urine proves to be considerably increased, comparatively, with the young; that is, the nitrogenous metamorphosis is lowered, qualitatively, as well. In another set of experiments Guryeff caused the supply of proteids to be reduced to 55 grammes (2 ounces) in the day, that of the fat to be increased to 87 grammes (3 ounces), and that of carbohydrates to 385 grammes ($12\frac{1}{2}$ ounces). From these experiments the author obtained the following results: 1. The assimilation of nitrogen was considerably diminished, averaging only 86.17 per cent. 2. The nitrogenous metamorphosis rose to 87.17 per cent. 3. The proportion of underoxidized products decreased; that is, the metabolism improved, qualitatively, as well. 4. The bodily weight in three cases increased (in one considerably), while in two it slightly decreased. 5. The subjective condition remained perfectly satisfactory all through. The author arrives at the general conclusion that in the dietary of non-working old people the proportion of proteids should be considerably lowered (comparatively, with the standard in vogue), while that of the fat and the carbohydrates correspondingly increased. He further believes that an habitual and abundant accumulation of underoxidized nitrogenous products in the tissues of old people (which results from an excessive supply of proteids, on the one hand, and from a senile deficiency in metabolic energy of cells, upon the other) must produce an injurious influence on their organism.

Nitrous Oxide.—The action of nitrous oxide and of a mixture of nitrous oxide and oxygen is the subject of an experimental investigation by H. C. Wood.⁸⁰⁵
May This author, with the assistance of David Cerna, has, in a previous research (see ANNUAL, 1891), shown that the circulatory phenomena of nitrous-oxide anæsthesia are very similar to those caused by inhalations of pure nitrogen, or by mechanical asphyxia; and, further, that the addition of a sufficient amount of oxygen to nitrous oxide prevents the production of anæsthesia by the latter agent. In the present study, Wood has observed, in a series of experiments on dogs, the effects of the addition of a small percentage of oxygen to the nitrous oxide inhaled, with special reference to the relations between the

time required to produce anæsthesia in an animal by the inhalation of nitrous oxide and that necessary for the production of anæsthesia in the same animal by complete exclusion of air, or, in other words, by mechanical asphyxia. The details of five experiments are given, and the results obtained are very interesting. It was found that the effect of the introduction of a little oxygen into the nitrous oxide was very pronounced; 3 per cent. of oxygen caused the average time required for the production of anæsthesia to lengthen from two minutes and thirteen seconds to four minutes and seventeen seconds, while the introduction of 5 per cent. of oxygen increased the period to eighteen minutes and fifteen seconds. This effect of oxygen is, the author believes, a very strong corroboration of the asphyxia theory. The general results appear to indicate that theoretically it is possible to get a mixture of oxygen and nitrous oxide which will contain sufficient oxygen to maintain for a length of time the vital function, and yet have so little oxygen that consciousness would be lost. The experiments seem to show that in the dog 6 per cent. of oxygen in the nitrous oxide is probably the nearest approach to a practical anæsthetic mixture that can be made. Wood believes that it is probable that in man a larger proportion of oxygen could be used, as he was rather surprised to find the powerful effect upon himself of two or three deep inhalations of nitrous oxide containing 5 per cent. of oxygen. The conclusions arrived at by the author in his present investigation are: first, confirmation of the view that nitrous oxide produces anæsthesia by cutting off the supply of oxygen; second, that a mixture of nitrous oxide with oxygen does not seem to be available as a practical anæsthetic.

Oleocreasote.—See Creasote.

Opium.—See Morphine.

Oxalate of Sodium.—See Oxalic Acid.

Oxalic Acid.—The action of the oxalate of sodium on the voluntary muscle of the frog has been studied by F. S. Lock,¹⁷⁸ July According to his experiments, a grass-frog's sartorius immersed in a 75-per-cent. sodium-oxalate solution becomes in a few seconds violent, active, undergoing an exaggeration of the movements of a similar muscle in a "normal saline" solution. In the course of half to three-quarters of an hour, it becomes motionless and is no longer irritable to electrical stimuli. The muscle, however, does

not pass into rigor, being little if at all shortened, and retaining all the flexibility and other physical characteristics of a still-living muscle. A sojourn of one to two hours in a 6-per-cent. sodium-chloride solution (containing lime) makes the muscle once more very distinctly electrically irritable. The author has not observed a complete restoration of irritability, and believes that it is probably never obtained. He further believes that, in the direct action of oxalate of sodium on muscle, we have, in all probability, the explanation of the "fibrillares Muskelzucken" and "starkes Muskelzittern" found by Kobert and Küssner to be a symptom of sodium-oxalate poisoning, and ascribed by them to an action on the central nervous system.

Oximides.—H. W. Pomfret, ⁹⁰_{June} says that the physiological actions of these bodies resemble in many points those of the nitrites. Before studying the actions of the oximido-bodies, the author investigated the behavior of their corresponding aldehydes and ketones. The fatty aldehydes, ethyl-, propyl-, isobutyl-, and heptylic-, were first examined, and their action was found to be evidenced chiefly in two ways,—as regards voluntary muscle-contraction and loss of irritability and contractility. A primary stimulation was always seen in minimal stimuli, but becoming more and more transient in equivalent dilutions as the series of aldehydes was ascended. In muscle-tracings a primary range of contraction was seen when dilute solutions were used, but the dilution must be increased with the atomic weight of the aldehyde. There was a primary shortening of the period of latency, which also varied as the primary stimulation.

These fatty aldehydes produced a primary increase of irritability of the spinal cord, followed by a secondary depression. The intensity of this primary stimulation of the spinal cord seemed scarcely to vary in the case of the lower three members; that is to say, ethyl-, propyl-, and isobutyl- aldehyde; whereas the potency of their secondary depressant action was intensified with their increasing weight. The latter three bodies all constricted the vessels of the excised sheep-kidney. The action varied inversely as the atomic weight. This constriction was followed by dilatation, by an influence exerted through the centres of the spinal cord. All the fatty aldehydes, again, exercised the same action on the heart, their difference being simply one of degree. They all tended to

slow the cardiac rhythm and to exercise a primary tonic and a secondary depressant action.

The corresponding aldoximes were next observed. They seemed to combine in their action that of a nitrite and that of an aldehyde. The fatty aldoximes depressed the irritability of the voluntary muscle, and diminished the extensibility, the elasticity, and the range of contraction of the same. There was also a shortening of the latent period. The fatty aldoximes differed among themselves in their action on voluntary muscle exactly as the corresponding aldehydes. As the series was ascended the action became more toxic, as was seen (first) in the increasing degree of contracture and (second) in the more-rapid loss of irritability. Upon the spinal cord and the circulation their action was correspondingly similar to that of the aldehydes, and in regard to the latter function there was observed a local vasomotor influence. The same may be said regarding their action on the cardiac rhythm, which was similar to that of dilute solutions of the nitrites, super-added to that of the aldehydes. The aromatic aldehydes, benz- and salicyl-, were found to have the same type of action as their fatty homologues, but differed from them in their much more powerful toxicity and greater dominance of irritation, which was more especially seen in their action upon the spinal cord and voluntary muscle. Both aromatic aldehydes acted as vasomotor dilators, though such an action was not very pronounced.

The two aromatic aldoximes, benz- and salicyl-, were found to differ slightly in their physiological actions from their corresponding aldehydes. Progressive contracture and loss of irritability were the main features of their action on voluntary muscle. Subcutaneous injections of these two aldoximes produced a decided irritability of the spinal cord, so much so as to cause tetanic convulsions in the muscles of the limbs. The salicylaldoxime was found to be a more-decided vaso-dilator than its aldehyde homologue. Excepting the non-occurrence of rhythm-retardation, in all other respects the cardiac actions of these two aldoximes were found identical to those of the aromatic bodies. Acetoxime and isonitrosoacetone were then studied. Acetoxime more especially repeated the actions of propylaldoxime, and in the presence of this fact it was observed that the molecular weight of acetoxime is exactly equivalent to that of propylaldoxime. Isonitrosoacetone

found its parallel intermediate to propylaldoxime and isobutylaldoxime, in some of its actions resembling the former, but, on the whole, being nearer to the latter. In molecular weight isonitrosoacetone finds its exact equivalent in isobutylaldoxime.

Acetone was the last substance examined. It was found that its actions on the isolated tissues and organs, with the exception of voluntary muscle, differed but little from those of propylaldehyde. Nervous depression was the principal feature of the general action of acetone on the frog. Injections of it paralyzed the spinal cord, and in muscle preparations it quickly depressed the irritability of the nervous path. It was on voluntary muscle that the action of acetone differed from that of the aldehydes. Pure acetone caused no contracture in muscles, and the muscle irritability was depressed rather than the contractility. In fact, the action of acetone on voluntary muscle was found to closely resemble that of ethyl alcohol. The drug acted at times as a vaso-constrictor. Acetone was found to be almost innocuous to the heart of the frog, but very large doses caused a depression of the systole with final arrest in diastole. From the results of this extensive and careful research the author believes that the influence of the oxime group of substances must be the same in each case, the influence being that of a nitrite.

Oxysparteine.—A pharmacological investigation of oxysparteine, an oxidation product of the alkaloid sparteine, has been published by K. Hurthle.⁸¹⁴_{Mar.} The experiments were made on dogs and frogs. Doses of from 3 to 5 centigrammes ($\frac{1}{2}$ to $\frac{7}{8}$ grain) for the former and of 1 centigramme ($\frac{1}{8}$ grain) for the latter animals caused no perceptible influence on the general condition, but still produced an increase in the force of the heart, with, as a rule, diminution in its frequency; the vascular tonus was not changed. The drug was employed hypodermatically.

Parachloralose.—Parachloralose is obtained in the same reaction in which chloralose (*q. v.*) is produced; it has identical chemical composition as the latter, but its molecular arrangement is different. Unlike chloralose, it boils at one point higher, and is absolutely insoluble. Parachloralose, which had been claimed by Mosso to be an hypnotic, has been investigated recently by Richet,¹⁴_{June 14} and found to be absolutely inert. The cat, for example, so susceptible to the hypnotic action of chloralose in doses of

0.006 gramme ($\frac{1}{11}$ grain) per kilogramme (2 pounds) of the body-weight, can take as much as 1.50 grammes ($23\frac{1}{4}$ grains) of parachloralose per kilogramme (2 pounds) of the body-weight without the slightest effect.

Pelletierine.—Coronedi ³⁷⁶_{Apr.30} has found that the acidity of muscles, under the influence of pelletierine, is greatly increased. The investigation was made on the muscles of the toad, noting the time required for an alkaline solution of phenol-phthaleine to become discolored under the influence of muscular acidity. It is probable that a sort of muscular rigidity is produced by pelletierine, and that its action on muscle must be considered as somewhat similar to that of veratrine, quinine, caffeine, digitaline, and other drugs.

Pental.—The only attempt, so far, at an experimental investigation of the physiological actions of this new anæsthetic appears to be that of David Cerna, ⁸¹⁴_{Oct} who, after careful research, has arrived at the following conclusions: 1. Pental possesses general anæsthetic properties. 2. The local anæsthetic effects are feeble. 3. Anæsthesia is rapidly established, but also quickly disappears. It is chiefly of centric origin. 4. Pental depresses the circulation to a dangerous degree, causing a fall of the arterial pressure and of the rate of the pulse, the latter phenomenon being followed by an increase even above the normal standard. 5. The lowering of the pressure is due to an action upon the heart and to a stimulation of the peripheral cardio-inhibitory centres. The vasomotor system is apparently not affected by the drug. 6. Under pental the pulse-rate is decreased at first, due similarly to a direct cardiac influence and to excitation of the cardio-inhibitory centres peripherally; the secondary increase to paralysis of the latter; and the final diminution to an action upon the heart. 7. The respiratory rate is increased by a direct action of the agent upon the respiratory centres. The respiration is afterward depressed through an influence exercised upon the same. The drug sometimes causes the Cheyne-Stokes type of respiratory movements. 8. Pental produces death mainly by cardiac paralysis. Sometimes, however, the heart and the respiration stop simultaneously; at others, a fatal issue is the result of respiratory failure. 9. The drug, in poisonous amounts, diminishes to a certain extent the irritability of the cardiac muscle. 10. Pental dilates the pupil, this phenomenon

being probably of centric origin. 11. The narcosis of pental is not unattended by unpleasant after-effects, the nature of these being principally that of excitement. 12. Pental cannot be considered as an efficient general anæsthetic, and is certainly inferior to ether and chloroform.

Permanganate of Potassium.—See Potassium Permanganate.

Phenoxycaffeine.—See Caffeine.

Phloridzin.—Rosenfeld ²²_{June 14} observed that animals fed on phloridzin after several days' fast showed a large quantity of fat in the liver (from 25 to 75 per cent.). The condition was not one of fatty degeneration, but of infiltration of the cells, the fat disappearing of itself and leaving no injury to the hepatic cells. The function of the liver was not disturbed, and the secretion of bile was unaltered. The fat did not first appear when only flesh or sugar was administered. The whole of the fat disappeared, and the more rapidly the greater the quantity of flesh or sugar given. It did not disappear, however, if fat was given with the food, but rather the addition of fat proceeded *pari passu* with the quantity of the fat administered. This interesting fact was not explained.

Phlorol.—See Creasote.

Phosphorus.—An interesting study of the relative value of the several substances recommended as antidotes to phosphorus has been published by E. Q. Thornton, of Philadelphia, ⁸⁰_{Jan.} who concludes that the permanganate of potassium is the best antidote for phosphorus. He advises the administration of the potassium salt before the phosphorus becomes absorbed, since vomiting will generally prevent the chemical reaction. The antidote must be well diluted (0.5- to 1-per-cent. solution), and must be given in excess, from the fact that a large portion of the permanganate is reduced by the organic substances of the stomach. He condemns the ingestion of the sulphate of copper, having observed that this substance almost always produces severe gastro-enteritis, and thus complicates the poisoning by the drug that is being combated; he found, in fact, that in all cases of phosphorous poisoning in which the sulphate of copper was employed as an antidote death was the inevitable result. Peroxide of hydrogen was tried in several of his experiments, but was found to oxidize the phosphorus very slowly, and to be too irritating upon the gastro-

intestinal tract to be of value. The author further contends that since old French oil of turpentine cannot be obtained, it should cease to be considered as a practical antidote.

Picrotoxin.—Koeppen²⁷³_{p.327, '52} has observed that picrotoxin antagonizes the effects of narcotic poisons. By means of the latter substances he has produced symptoms similar to those of collapse, and, under such conditions, studied the actions of picrotoxin. Frogs and rabbits were narcotized and paralyzed by chloral, urethane, and paraldehyde; picrotoxin, given hypodermatically, produced no notable change either on the sleep or the paralysis. In rabbits, after having produced a fall of the arterial pressure and a slowing of the respiration by an intra-venous injection of chloral, a rise of the pressure and an acceleration of the respiration were caused by picrotoxin administered intra-venously also. Similarly, picrotoxin lessens the fall of pressure produced during chloroform narcosis; and the same result is effected during narcosis by urethane, paraldehyde, or amylene hydrate. In these latter instances, however, the action of picrotoxin is less marked, owing to the fact that the effect on pressure produced by the narcotics mentioned is also less pronounced. In the majority of instances, the author affirms, picrotoxin is capable of stimulating both the circulatory and respiratory centres.

Pilocarpine.—A study of the actions of this drug on the blood-pressure and pulse has been made by Edward T. Reichert,¹¹²_{Apr.} who found that there is a general relation between the frequency of the heart's beat and the height of the pulse-curves. During the stage of increased pulse-rate the curves are correspondingly small; but during the diminution of the rate the curves are higher in proportion to the diminution, until very late in the poisoning, when the heart fails. There is also a relation between the pulse-rate and the arterial pressure. The tendency of the poison throughout its action is to decrease the pressure, and this is aided by the increase in the pulse-rate during the first stage, and subsequently by the reduction in the rate. In other words, there are two factors involved in the decrease of pressure,—cardiac and vasomotor. Late in the poisoning the vasomotor centres are completely paralyzed. The author also found that the action of pilocarpine on the respiration was decided, both the rate and depth of this function being greatly increased.

According to J. Horbaczewski,^{2047, 80}_{p.101,'92; Mar.} pilocarpine causes an increase in the number of leucocytes in the blood and a correlative increase in the quantity of uric acid. The dose of the drug administered by the mouth was 1 centigramme ($\frac{1}{6}$ grain) in each of the cases observed, three in number. In a fourth case $1\frac{1}{2}$ centigrammes ($\frac{1}{4}$ grain) were employed. In experiments performed upon the lower animals pilocarpine given hypodermatically, in doses of from $\frac{1}{2}$ to 3 centigrammes ($\frac{1}{12}$ to $\frac{1}{2}$ grain) per kilogramme (2 pounds) of the body-weight, only produced an increase in the size of the spleen. This result is the more remarkable since the drug is an excitant of the contractile elements of the muscular fibre; it has a similar action on the walls of the intestine, causing a constant diarrhœa. The author calls attention to the contrast existing between the effects produced by quinine and those caused by pilocarpine. Quinine, without influencing the contractile elements at all, diminishes the volume of the spleen; while pilocarpine, acting on these contractile elements, produces an increase in the size of the organ. The observer believes that these changes in the spleen, caused by the two medicaments, occur independent of any action exercised by the drugs on the contractile elements of the organ. Sabbatani⁸⁶⁸_{May 6} concludes that this drug exercises a decided diuretic action, and that, under normal circumstances, its power is easily masked by the marked increase which it produces in other secretions. He has observed, also, that pilocarpine causes a diminution in the volume of the kidney and an increase of the arterial pressure, these effects being due to a direct, stimulating action upon the coats of the blood-vessels. This latter phenomenon is supported by the fact that pilocarpine acts decidedly, as has been clearly demonstrated, upon the muscular fibres of the iris, intestines, bladder, and uterus.

A series of experimental observations on the actions of this drug on the bodily temperature has been carefully made by Edward T. Reichert.¹¹²_{Aug.} The evidence presented by various investigators heretofore has been mainly contradictory,—some asserting that under the influence of pilocarpine the temperature is lowered, others that it is increased, and still others that it is primarily increased and secondarily decreased. Reichert has arrived at the following conclusions: 1. Pilocarpine first increases and then decreases bodily temperature. 2. Heat production and heat dissi-

pation are first increased and then diminished. Heat production is the process primarily affected, the alterations in heat dissipation following and being dependent upon the effects on heat production, excepting after very large doses, when heat dissipation may be depressed even more than the production during the stage of lessened heat production. 3. The alternations in temperature are dependent essentially upon the actions on heat production, but may be affected by sweating and, after very large doses, by alterations in heat dissipation. The primary increase of temperature is due at first to an increase of heat production, but after very large doses this increase may be exaggerated and continued by a diminution of heat dissipation which is greater than the depression of heat production. The decrease of bodily temperature is due to a diminution of heat production, but may, in part, be due to sweating. 4. The actions on the process of heat production are so much more potent in their effects on temperature than those on the sweat-glands that it is doubtful if the latter ever play an important part in the temperature alterations. 5. Bodily temperature may be increased during the stage of diminished heat production, owing to the great depression of heat dissipation. 6. The amount of increase and decrease of temperature and the duration of each of these periods are essentially in direct relation to the dose.

Potassium Bromide.—See Bromides.

Potassium Iodide.—See Iodides.

Potassium Permanganate.—Antal^{622 814}_{No. 7, June} studied the action of this substance in animals poisoned by muscarine, strychnine, colchicine, oil of savine, and oxalic acid. Animals poisoned with an aqueous solution of muscarine exhibited all the toxic phenomena, but those treated with muscarine solution to which the permanganate had been added did not show the slightest intoxication. The same results were obtained in the case of strychnine. When this alkaloid was administered hypodermatically, it did not produce its toxic effects, if $\frac{1}{8}$ -per-cent. solution of the potassium permanganate were given immediately afterward in sufficiently large amounts. It proved an efficient antidote to colchicine and the oil of savine. It is stated that when permanganate of potassium and oxalic acid are brought into contact, the former agent gives off a portion of its oxygen, and the oxalic acid is decomposed into water

and carbon dioxide. It was found that rabbits succumbed within an hour under the influence of 25 centigrammes (4 grains) of oxalic acid; those rabbits, however, receiving 25 centigrammes (4 grains) of a $\frac{1}{2}$ -per-cent. solution of permanganate of potassium immediately after the fatal dose of the oxalic acid survived.

Quinine.—P. Kandidoff⁵⁸⁶_{No.13} has observed that this drug, when administered by the rectum, is eliminated by the mucous membrane of the stomach after elimination by the kidneys has begun.

Salicylate of Sodium.—See Salicylic acid.

Salicylic Acid.—The salicylate of sodium, according to Lemanski and Main,¹⁴_{Jan.29} is found in the urine in about thirty-five minutes after its administration by the mouth, and in about twenty-five minutes when introduced by the rectum.

Salol.—According to Paul Cornet,⁷³_{Dec.24,'92} salicylic acid by itself or in combination is converted through the blood into an alkaline salicylate. Lemanski and Main,¹⁴_{Jan.29} have observed that salol begins to be eliminated thirty minutes after its ingestion by the stomach, and in about four hours after its administration through the rectum. The authors further affirm that salol is decomposed under the alkaline influence of the pancreatic juice.

Sodium.—The influence of fluoride of sodium on the organs and tissues has been studied by Pitotti.⁴⁷²_{Jan. 2, July 8} Gradually increasing doses were administered to animals of neutral solutions of the salt, so as not to produce immediately fatal results. In this manner the animals became emaciated and their blood poor in corpuscular elements. As a result of acute intoxication there was observed degeneration of the renal epithelium, particularly of Henle's loops and the convoluted tubules. The tubes were sometimes found blocked with *débris* of the cells. Diffuse fatty degeneration of the liver was also caused. No histological changes were observed in the nervous system, notwithstanding that during life alteration of this function was noticed. Subcutaneous injection of 1-per-cent. solutions produced marked irritation and hæmorrhage into the deep layers of the dermis. The gastro-intestinal tract remained unaltered, although there was some vascular dilatation. In subacute poisoning the lymphatic glands became enlarged. The drug was found more toxic in acid than in neutral solutions.

The effects of fluoride of sodium have also been studied by J. Brandl and Tappeiner.³⁹¹_{V.28, p. 519} It is generally believed that the

fluorides are eliminated by the urine. The authors found that only about one-fifth of the amount ingested leaves the organism by this means. They gave to a dog, for instance, a daily dose of the fluoride, varying from 1 decigramme to 1 gramme ($1\frac{3}{4}$ to $15\frac{1}{2}$ grains), and examined the excreta very carefully for more than a year. After death they found fluorine in the different organs. There were, in 100 grammes ($3\frac{1}{4}$ ounces) of blood, 0.120 gramme ($1\frac{7}{8}$ grains) of the fluoride of sodium; in the same amount of muscle, 0.13 gramme (2 grains); in the liver, 0.09 gramme ($1\frac{1}{2}$ grains); in the skin, 0.33 gramme ($5\frac{1}{4}$ grains). The tissues were weighed in the dry state. In the skeleton were found 5.19 grammes ($1\frac{1}{4}$ drachms); in the teeth, 1 gramme ($15\frac{1}{2}$ grains). The animal, weighing about 12 kilogrammes (24 pounds), had assimilated 64 grammes ($1\frac{7}{8}$ ounces) of fluorine. The cartilage and bone presented some anatomical changes. It appears, therefore, that an important deposit of the fluorides occurs in the tissues. Most of it is evidently deposited in the bone under a crystalline form.

A. Gilbert¹⁴_{July 26} has made a series of observations with bicarbonate of sodium on the chemistry of the stomach contents. Ingested in large doses by a dog, together with the meat, bicarbonate of sodium renders the gastric contents alkaline for about half an hour. The acidity begins to increase after this time. The increase of chlorine, during the first quarter of an hour, is quite noticeable; it is less marked after half an hour, and in three-quarters of an hour it disappears. In small doses, the drug has a similar but weaker range of action. It causes a diminution of the acidity, this disappearing in about an hour. It also increases the amount of chlorine, this disappearing in about three-quarters of an hour. Given one hour after the meat, the drug diminishes the acid contents of the stomach; and, administered half an hour after the meat, it produces, during the first half-hour, a diminution of the acid in the stomach and a slight depressant effect on chlorine as a whole, and on the organic combinations of chlorine; but, on the contrary, it causes an abnormal quantity of hydrochloric acid.

Sodium Nitrite.—See Nitrites.

Sodium Oxalate.—See Oxalic Acid.

Sodium Salicylate.—See Salicylic Acid.

Strontium.—According to A. Malbec,²⁹⁶_{Sept. 24, '92;} ⁸⁰Mar. iodide of strontium produces a momentary rise of the arterial pressure and an

increase in the number of cardiac pulsations. These phenomena soon disappear, and if the ingestion of the drug is insisted upon the arterial pressure falls, while the cardiac contractions continue to increase in number, accompanied with periodic and rhythmical variations. The author believes that the new remedy acts chiefly upon the vasomotor centres and directly on the heart. It appears that the drug, in the first period, acts like the potassium salt, but less energetically. In the second period, when large doses are employed, the stimulating influence of the strontium iodide is as decided as that of the potassium salt.

Strychnine.—In an investigation of the action of this alkaloid upon the respiration, H. C. Wood and David Cerna,¹⁷⁸ obtained concordant results from a series of experiments upon normal dogs, showing that the injection of strychnine produces an extraordinary increase in the respiratory air-movement, the increase varying from 75 to 300 per cent. The action of strychnine upon morphinized and chloralized animals was also studied, with identical results, showing that the alkaloid of nux vomica powerfully influences the respiratory movement of air, and that it, therefore, is a true respiratory stimulant.

Sulphonal.—The changes that sulphonal undergoes in its passage through the organism have been studied experimentally by William J. Smith, of London.¹⁵ From a series of experiments upon dogs, he appears to have demonstrated that sulphonal in the system splits in such an indirect manner as to yield ethylsulphonic acid, and that this latter substance is eliminated unaltered through the urine.

Sulphur.—Apropos of a report of Andrew Wilson on the mental derangements occasioned by sulphuretted hydrogen, Richardson³⁸ gives his own experience in regard to the action of the series of bodies called alcohols, with particular reference to the peculiar behavior of *sulphur alcohol*, or mercaptan. This substance is a fluid made by saturating an alcoholic solution of potash with sulphuretted hydrogen, and then treating the solution with ethyl iodide. He showed that a person brought under the action of this sulphur compound was subjected to extreme variations of mind and body, namely, a desire to sleep,—a strange, unhappy, dreamy sensation, as from some actual or impending trouble,—succeeded by an easy but extreme sense of muscular

fatigue, so that the limbs felt too heavy to be lifted, with depression and slowness of the pulse,—effects which last for several hours, until, in fact, the sulphur is eliminated. He also observed the fact—very important to remember in respect to the relationship of muscular paralysis and mental disturbance—that, while other narcotic and paralyzing agents cause primary paralysis of the voluntary muscles and secondary paralysis of the heart and the respiratory muscles, with recovery (when recovery occurs) first of the voluntary and afterward of the involuntary, the voluntary muscles, under this mercaptan, lose their irritability last and regain it first. In a further research on the same subject, the same writer came to the conclusion that the influence exerted over nervous matter by the element sulphur, in disintegration, was so marked in mental aberration that it was inevitable that melancholia and other nervous affections, attended with or without paralysis of voluntary muscles, must some day be accepted as due to the presence of compounds of this element. The action of sulphur products in producing deliriums appears to be supported by later observations.

Tannic Acid.—The elimination of this substance, when administered by the rectum, has been investigated by P. Kandidoff.⁵⁸⁶
No. 13 The presence of the drug could not be detected either in the stomach or in the urine.

Terpinol.—Paul Binet,¹⁹⁷
June, July detected only traces of terpinol in the expired air three to four hours after its administration by the stomach.

Theobromine.—The action of this drug on the circulation has been studied by W. Cohnstein,¹³
No. 6, '92; Jan. 80 whose conclusions are as follow: 1. An increase of the blood-pressure following the use of theobromine cannot be detected. 2. No constant influence upon the frequency of the pulse could be noted. 3. No influence upon the energy of the cardiac contractions (shown by the height of the pulse-wave) could ever be observed. 4. After very large doses there was finally a gradual sinking of the pressure; occasionally, also, a lessening of the pulse-frequency. 5. Theobromine in physiological doses has no perceptible action upon the heart and vascular system of mammals. The direct improvement of the heart-action and pulse, which some have ascribed to theobromine, occurs only secondarily, as the result of freeing the organism of harmful fluids by means of the diuresis brought about by the drug.

Thymacetine.—An experimental research of the action of thymacetine upon man has been instituted by E. Marandon de Montyel, ⁶⁷_{Jan.30} from which the investigator draws the following interesting conclusions: 1. Thymacetine does not seem to exercise an action on sleep, the intellect, the vasomotor system, the genital organs, the secretions, or the intestines. 2. Thymacetine, without influencing any of the other reflexes, produces in a few instances a marked double dilatation of the pupil, but without disturbances of vision, the symptom appearing during the first hour, and lasting from thirty to forty minutes. 3. Thymacetine sometimes produces immediately after its administration, but only for a short time, however, dizziness, associated with a slight degree of intoxication. 4. In three-fourths of the cases thymacetine causes a slight headache, this lasting several hours, appearing usually at bed-time, and, rarely, next morning on awakening. 5. Thymacetine always increases, for about two hours, muscular force, as measured by the dynamometer. 6. Thymacetine increases the bodily temperature to about one degree, the elevation, like the decline of the same, occurring gradually, and returning to the normal point in about two hours. 7. Thymacetine, during a period of two hours, increases the number of inspirations without modifying their rhythm. 8. The drug also causes, during the same period of two hours, a rise of the arterial pressure and an increase in the number of pulsations, but without producing cardiac palpitations. 9. Thymacetine, in two-thirds of the cases, causes great lassitude toward the afternoon, which often persists till the following day, even after awaking; but there are no concomitant physiological or psychological disturbances produced. 10. Thymacetine, in all cases, modifies micturition in three ways: (a) it accelerates or delays the desire of urinating; (b) it causes a urethro-vesical spasm, a momentary retention, and dysuria, but these disturbances soon disappear; (c) occasionally during the passage of urine a scalding sensation is felt, which also soon disappears; these occur singly or in combination. 11. Exceptionally before micturition thymacetine produces shooting urethral pains. 12. Thymacetine, in two-thirds of the cases, causes a bitter taste, accompanied with a sore mouth and a coated tongue, but no special odor of the breath. 13. In most individuals thymacetine produces, during an hour or more, a burning gastric pain, more often localized, but sometimes felt all over the body; rarely, a

scalding sensation is felt along the œsophagus. 14. Thymacétine is capable of producing marked thirst, anorexia, and also gastric disturbances, which disappear on the suspension of the drug. 15. In a general way the organs become rapidly accustomed to the action of thymacétine, especially the bladder and the urethra; the stomach, however, is the only organ to become more susceptible to the influence of the remedy. 16. All the preceding physiological actions are produced by small doses; still, the sensation of dizziness, the temperature, digestion, and micturition are influenced in direct proportion to the amount of the drug ingested.

Trimethylamine.—According to Combemale,⁶⁷_{Apr.15} the formula of this substance is set down as $N(CH_3)_3$. It is a gas at ordinary temperatures, but below these it becomes a liquid. The odor resembles that of ammonia and putrid fish; it has a decided alkaline reaction, and is readily soluble in water and alcohol. The drug is said to be found also in the vegetable kingdom, particularly in the leaves of the *Chenopodium vulvaria*, in the flowers of *Cratægeus oxyacantha*, in ergot, *Secale cornutum*, and in *Sorbus aucuparia*. Trimethylamine has similarly been obtained from the animal kingdom, especially from the herring, codliver-oil, the blood and urine of man, and from animal oil. According to the experimental studies of the author, the physiological effects of trimethylamine may be summed up as follows: 1. No matter how ingested, the most constant effect of the drug is the immediate hypersecretion of saliva, accompanied by an increase of the alkalinity of this fluid. Sometimes the secretions of the nasal mucous membrane and of the lachrymal gland are also increased. Another common effect is albuminuria, this appearing a few days after the administration of the drug. 2. Injected hypodermatically, in aqueous solutions of the strength of 1 to 100, trimethylamine acts as a powerful caustic, producing ulcerations that heal with difficulty. 3. In solutions of the strength of 1 to 200, or in doses of about 3 centigrammes ($\frac{1}{2}$ grain) per kilogramme (2 pounds) of the body-weight, trimethylamine lowers the temperature. This hypothermia, which can also be produced when the drug is given by the stomach in doses from three to seven times as large, is not constant. 4. In all instances, trimethylamine, in higher doses than 2 centigrammes ($\frac{1}{3}$ grain) per kilogramme (2 pounds) of the body-weight, causes an increase in the pulse-rate.

Paul Binet¹⁹⁷_{June, July} believes that the elimination of this substance by the lungs is doubtful.

Turpentine.—Paul Binet¹⁹⁷_{June, July} has found that only traces of turpentine appear in the expired air in from three to four hours after its ingestion by the stomach.

When administered by the mouth, according to Lemanski and Main,¹⁴_{Jan. 29} turpentine gives to the urine the odor of violets forty-five minutes after its ingestion, but fails to give this characteristic odor when introduced through the rectum.

Vagi, Section of, and the Respiratory Movement of Air.—H. C. Wood and David Cerna¹⁷⁸_{p. 870, '92} found that the action of section of the pneumogastric nerves upon air-movements in the dog varies; that usually, when the rate falls and the ordinary slow, full breathing of vagi section is obtained, the total amount of air moved is less than the norm; on the other hand, in some cases after section of the par vagum, the gain in the extent of the respiratory movements more than compensates for the loss in rate. The influence of section of the vagi upon the respiratory movements may be, in the dog, dominated by general or emotional excitement, disturbances of temperature, etc. To put aside these sources of error, the experimenters kept the dog in a uniform temperature, and efforts were made to render the animal as quiet as possible. The results of the experiments have warranted the authors in concluding that, in the dog, the general tendency is toward a lessened movement of air after section of the vagi, but that this tendency is not sufficiently strong to prevent its being set aside by disturbing causes; and that sometimes after section of the pneumogastrics the respiratory movement of air is not only not lessened, but is increased without their being able to assign a reason for the exceptional result.

Venesection.—Antokopenko⁵⁸⁶_{No. 24; Aug. 20}⁶⁷ studied the morphological changes produced in the blood and the marrow of bone under the influence of blood-letting. The blood was examined from three to five days before the first venesection, and then after each bleeding. In another series of experiments the investigator introduced intravenously, immediately after the venesection, a solution of chloride of sodium (0.75, 0.6, and 0.3 per 100), in quantities equal to the amount of blood extracted. The medulla of bone of healthy dogs and that of dogs that had been subjected to blood-letting were

then carefully examined for from two to seven days, and from two to four weeks and even three months. The author found an increase of the leucocytes the first few hours after the bleeding. This leucocytosis gradually increased and reached its maximum toward the end of the first twenty-four hours, and was dependent upon an increase both of the young and old elements of the blood. At the end of the second week a "secondary leucocytosis" followed, after which the blood assumed its normal condition. A second bleeding was followed by similar results, but no "secondary leucocytosis" was observed under these circumstances. No primary leucocytosis was noticed after a third venesection. If during the height of the leucocytosis bleeding was induced, the phenomenon would be more marked. Again, if after the bleeding a transfusion of salt water was made, the young as well as the old elements of the blood would diminish in number during the first hours after the operation. The author concludes, from the results of his experiments, that after bleeding the blood becomes quite young, and in its composition resembles the blood after the crisis of an acute infectious disease, as, for instance, fibrinous pneumonia.

ELECTRO-THERAPEUTICS.

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GENERAL CONSIDERATIONS.

Laws of Electrical Diagnosis.—Spehl ²¹⁹_{Feb.} elucidates a somewhat obscure subject for the general practitioner by the following statement of the method of electrical exploration: Precision is the object to be attained, and the factors are (*a*) the degree of contractility, (*b*) the amount of sensibility, and (*c*) the amount of resistance. In using the galvanic current we must take into consideration:—

1. The direction of the current. This may be (*a*) ascending, from the periphery to the centre; or (*b*) descending, from centre to periphery. The direction is important because at the negative pole there is an increase of excitability and conduction, and closure gives the maximum effect. At the positive pole there is a diminution of excitability, and opening gives the maximum. Hence the negative pole with a descending current is the one to use.

2. The intensity of the current, indicated by $I = \frac{E}{R}$, must be measured by the galvanometer. Pflüger denominates a feeble current as one of 1 to 3 milliamperes; a medium, one from 8 to 10 milliamperes; and a strong current, one over 10 milliamperes. As a key to formulæ, we have: Closing = F.; Opening = O.; Negative = N. (or K.); Positive = P. (or An.); Contraction = C. Hence for feeble current we have N.F.C.; for medium current, N.F.C., P.F.C., or P.O.C.; and for a strong current, N.F.C., P.F.C., P.O.C., or N.O.C. The relative resistance of the tissues is represented by the muscles as 1, the nerves 2.5, and the skin 100 to 500. In clinical use the latter usually represents a resistance of from 800 to 2500 ohms.

3. The dimension of the electrodes. When the two have different dimensions the density of the current in each is inversely proportional to its surface. Hence the effect is greater for a given intensity when the exciting electrode is smaller, relative to the indifferent electrode. Further, the resistance is as much less as the electrode is larger.

4. Points of application of electrodes must be specified with care, because the excitation at motor points is greater than of muscles. In general, the large indifferent electrode is placed on the sternum or sacrum; the small exciting one is placed on the region to be explored.

5. Duration of passage must also be reckoned, because the intensity of a given electro-motor force, as shown by the galvanometer, increases notably at the end of one or two minutes.

Physiological Effects of Electrical Currents of High Frequency.
—The demonstrations which were given by Tesla last year left an impression that enormous voltages were harmless to the human body if only they could be made to alternate with sufficient rapidity, and people were astounded at the spectacle of a lecturer placing himself in a circuit carrying a current alternating some hundreds of thousands of times per second, at a pressure of many thousands of volts. These experiments, coming not long after the accounts of the execution of criminals by electricity in this country with pressures of 1200 or 1500 volts, and compared with the occasional notices in the newspapers of fatal accidents to workmen engaged upon electric-light cables at 1000 volts, made it seem as though the rapidity of alternation was the factor which protected Tesla from injury by the enormously high voltages which he was handling. The same view is taken by d'Arsonval ⁷²⁰ ¹⁰⁶¹ _{Apr., May, June; Apr.} in his papers before the Société de Biologie. He describes an apparatus consisting of an induction coil supplying current to Leyden jars, the jars being made to discharge through a circuit including a helix of ten turns of thick wire and an air-gap. In this way there is set up in the circuit a succession of sudden rushes of current, which oscillate hundreds of thousands or even millions of times per second, the rate being determined by the Leyden jars; and the wire helix becomes the seat of electro-magnetic induction effects, comparable exactly to the induced primary currents of a medical induction coil, but very much more intense. These induced currents of the

helix are the subject of d'Arsonval's experiments. By attaching wires to the beginning and end of the helix the induced currents or extra currents can be led off; their energy was sufficient to bring to full incandescence a lamp requiring 2 ampères to light it, and it was therefore assumed that they had a magnitude of 2 ampères. The electromotive force of the currents was at least 8000 or 10,000 volts, because they were able to leap across an air-gap of several millimetres, and yet their effect upon the tissues of the body was very slight; in fact, they were hardly felt.

Now, it is certain that a current of far less than 1 ampère, either steady or alternating 20, 50, or 100 times per second, would produce unbearable and dangerous shocks in its passage through the tissues; and the inference drawn is that the extreme frequency of alternation can render a current of dangerous magnitude innocuous. Such an inference may not be a proper one, for the following reasons:—

1. A Leyden jar discharging through the body produces effects which are painful and severe, as all who have felt them will agree; but yet this is a discharge of high frequency of alternation; in fact, it is by the Leyden jars in the circuit that the oscillatory character and the rapid rate of alternation of the discharge are determined. Oliver Lodge gives the rate of oscillation for a pint-sized Leyden jar at ten million per second; for jars of greater capacity the rate is less rapid.

2. The high frequency and high potential discharges of Tesla's apparatus are not altogether harmless, but can produce severe shocks and can kill small animals, as Elihu Thomson has shown. The discharges from the terminals of such an apparatus can produce severe muscular contractions, even with the resistance of a considerable air-space interposed in the circuit; so much so that in some recent experiments it was considered prudent to proceed no further with the experiment of actually touching both the terminals of the coil at once.

3. It is very doubtful whether d'Arsonval's estimation of the magnitude of the current of his apparatus is correct. The incandescence of a lamp-filament with currents of high frequency has been recently under discussion in some of the electrical journals, and a very satisfactory explanation of the phenomenon has been forthcoming. It is well known that for alternating currents the

resistance of a conductor is greater than it is for steady currents, and the increase of resistance rises rapidly as the rate of alternation becomes greater; and with frequencies approaching one million per second the effective resistance of the lamp used by d'Arsonval would be raised enormously; this would require the energy needed to bring it to incandescence to be applied at a proportionately higher voltage, while the magnitude of the current would be lessened in an equal degree. For example, the energy of 2 ampères at 100 volts is the same in amount as that of 0.02 of an ampère (20 milliampères) at 10,000 volts.

It is therefore probable that the current which raised d'Arsonval's 2-ampère lamp to bright incandescence was very much less than 2 ampères, and was probably only a few milliampères; and herein lies the pith of the whole question. The experiments with high-frequency currents of high tension are harmless if the magnitude of the current is small; and as the high potential is, in fact, obtained at the expense of the current, this latter diminishes in proportion as the potential is raised by each successive step up in the transforming apparatus. For the present it may be taken as not yet proved that high frequency of alternation can render electrical currents harmless; and it may still be accepted that the effect produced by the passage of a current through living tissues depends primarily upon the magnitude of the current, as measured in ampères, which is made to traverse them, and upon its density or concentration therein.

Action of Electrical Currents as Therapeutic Agents.—D'Arsonval made some observations ¹⁰⁶¹_{July 15} to show that the excitability of the nerves and muscles after death is much greater than generally supposed. It was thought to disappear after an hour or two. By means of a myophone he detected contractions ten hours after death, demonstrating that the nerve can act on the muscle without causing an apparent contraction, but only a simple molecular vibration. He thus explains how the loss of excitability of a motor nerve may sometimes coincide with the retention of its trophic properties, as was the fact in a case of radial paralysis reported to the Société de Biologie in 1886, by Déjerine and Vulpian.

Delprat seems to furnish proof that Möbius's contention is true, viz., that the effect of electrical treatment is due to suggestion. ⁶⁸⁵_{Mar.} He seeks to establish this by experimental proof in

cases of paralysis of the forearm due to pressure in sleep. He took three patients and measured with a dynamometer the muscular force of the well hand and the paralyzed one. The first patient was subjected to the faradic current, the second to the galvanic current, and the third to the apparatus so arranged that the circuit was broken and no electrical effect could be produced. The therapeutic result was equally favorable in all three, and in the third case the amelioration was evidently due to suggestion.

Autoconduction is a new method of electrization of living beings by means of magnetic fields of great frequency. To the three usual methods of franklinism, galvanism, and faradism, d'Arsonval, of Paris, has added two others, which it is thought will be of great service⁷²⁰_{June}: (a) sinusoidal galvanism, and (b) electrization by currents of great frequency. Formerly the human body was put in communication with the electric source by appropriate conductors; in this new method the patient is completely isolated from the electric source,—the currents circulating in him being currents induced in his own tissues. These currents, while of considerable power and acting energetically on the vitality, cause no pain or phenomena. The magnetic field is a cylinder of insulating material of proper size, around which are wound several turns of an electric-light cable, carefully insulated. This makes a solenoid, within which the patient is placed; through this solenoid is passed a current from a condenser rendered oscillatory by his method,—i.e., 2 to 12 Leyden jars. The treatment is given periodically through current-breaker giving about 15,000 volts. This is driven by a Siemen alternator, giving at the maximum a current of 12 ampères with 350 volts. This mode exercises a very powerful influence on the functions of nutrition, as the analysis of the products of respiration shows.

THERAPEUTICS OF THE GALVANIC AND FARADIC CURRENTS.

Cerebral Apoplexy.—De Renzi, of Naples,⁸⁷⁹_{May} formulates the following results from the electrical treatment of cerebral apoplexy, whether hæmorrhagic or embolic: 1. Its action is undeniable, since it immediately brings out voluntary motor excitability in the paralyzed members. 2. The effect depends on the muscular contractions. 3. The curative effect of the current cannot be explained by the resorption of the escaped liquid (Remak), because

a resorption is necessarily slow, whereas the disappearance of the paralysis is immediate. 4. Neither can it be explained by his own theory, that the electricity triumphs over the nerve paralysis. 5. Faradic currents should be applied to the paralyzed muscles; in all probability they act by provoking contraction and awakening the motor memory abolished by the apoplectic stroke.

Paralysis.—Parkinsonian monoplegia, generally thought most rebellious to all medication, has yielded in one instance, in the hands of Dignat, of Paris, ⁷²⁰_{Feb.} to the induced current. Most neurologists consider this current as useless, especially since the researches of Gull. The patient was 71 years of age, and the disease of four years' duration. Treatment consisted of applications to muscular groups for several months. After interrupted treatment for six months no trembling nor stiffness of the arms or hands remained.

Danion, of Paris, ²⁴⁴_{Mar.} has proved satisfactorily that the direct action of the voltaic current on the brain and spinal cord, long disputed, is a fact. His conclusion from experimental observations is that electrical currents are easily applicable to the brain and spinal cord, and that it is erroneous to discard them on account of their supposed inefficacy. He adds a case of cure of nocturnal emissions and erections due to disease of the cord.

Obesity of Nervous Origin.—Imbert de la Touche, of Lyons, ¹⁴_{Aug. 13} reached the following conclusions: (a) Electricity possesses an incontestable action in the cure of obesity of nervous origin or fatty anæmia, so frequent in neurasthenia. (b) The static electric bath is the best method of application. (c) All other medication is suspended, as electricity is directed solely to re-establishing the nervous equilibrium.

Alcoholic paraplegia in a woman 30 years of age was completely cured by Massy, of Paris, ¹⁸⁸_{Apr. 23} by the use of combined galvanization of the spinal cord and the paralyzed muscles. Later, faradization was employed.

Tuberculosis.—De Renzi, of Naples ⁵⁹⁶_{Mar.}; Soupinsky, of St. Petersburg, ⁷²⁰_{Mar.} and others have been making investigations as to the value of electricity in the treatment of infectious diseases, and especially of phthisis pulmonalis. They sought a current of sufficient tension to overcome easily the body resistance and to permit long and numerous applications. The problem, then, was

to bring about the destruction or attenuation of the morbid principle by strong currents, without inducing general or local troubles. This was accomplished. In cases of exudative pleuritis, tubercular or otherwise, de Renzi, after a few days, observing the exudation diminish and disappear. In all tubercular cases there was a sensible increase in weight and a notable diminution and even cessation of fever. The number of bacilli lessened. The author is not yet ready to formulate his conclusions. Soupinsky cites an interesting case of a woman of 28 years with tubercular infiltration of both apices, pleuritic effusion, hæmoptysis, night-sweats, emaciation, and bacilli in the sputum. She was daily given faradizations of ten minutes each. After three months there were no dyspnœa, no night-sweats, no râles, and very few bacilli. Two years and a half after treatment ceased she continued to be in good health. Three other similar cases were reported by him.

Saturnism.—Semmola, of Naples, ¹⁴_{Nov. 9, '02} conceived the idea of applying the continuous current to cases of poisoning, eliminating the lead through action on the ganglionic centres. He placed, for one-half the sitting, the positive pole on the tongue and the negative on the epigastrium; during the other half the positive on the sides of the vertebral column and the negative on the abdomen. A Wollaston pile of 10 elements, with an intensity of 100 to 150 milliamperes, was used. After a few days of treatment lead began to appear in the urine. At the end of three months the cure was obtained in 6 cases. There were 25 later cases, 15 of which were simple colic with extensor paralysis, 8 of the cachectic form with albuminuria, but no apparent vascular alterations, and 2 of the nervous form with arterial sclerosis and its consequences. The method produced permanent cure in the first form; considerable amelioration, but not complete disappearance of albuminuria, in the second form; but no result in the third form, which ended fatally.

Dyspepsia.—Ravé, ⁷²⁰_{No. 3} in an excellent study, gives the results of electricity in 11 cases of Hayem's: External galvanization was used in 9 cases, 7 of which were of hyperacidity with dilatation, 2 of these being attended by intense gastralgic crises, and 2 cases of lack of acidity, 1 accompanied by dilatation. Treatment provoked a characteristic crisis, soon followed by relief and final cure, —i.e., return of appetite, reduction of dilatation, disappearance of

atony, and return to ordinary diet without inconvenience. The same result was obtained in the cases in which internal galvanization was employed, except that momentary crises were not brought on by the treatment,—a fact much in favor of this method.

Diarrhœa of Cholera.—Arslan, of Paris ⁷³ Jan. 23; ¹⁷⁰ Mar. reports upon the use of electricity in the various forms of diarrhœa, particularly of cholera, as practiced in the wards of Jules Simon, at the Hôpital des Enfants-Malades. Having observed that the faradic current directly applied to the abdominal walls succeeded in stopping the diarrhœa in the first few cases tried, it was used in all cases, even in intestinal tuberculosis, generally rebellious to all forms of treatment, with gratifying success. The simplest form of a faradic battery is sufficient, and the current should be strong enough to produce visible contractions of the abdominal muscles. Both poles should be placed upon the abdomen for intervals of one or two minutes. As a rule, after the third or fourth treatment the diarrhœa ceases, the other symptoms—as fever, vomiting, anorexia, etc.—being also improved. In some cases a single application is sufficient. No inconveniences are observed by the patient, and the current is well borne. In some 30 cases treated in the same way the results were in every way favorable, although several applications were necessary. No other treatment was instituted, save hygiene and strict attention to diet, and the favorable results may, without contradiction, be attributed to the faradic current.

Articular Disorders.—In reducing joint adhesions, Douglas Graham, of Boston, ¹⁵ Aug. has found a strong faradic current to be a most useful analgesic. He practices massage and stretching of the joint, alternating with a strong application of faradism. In this way the patient is able to submit to a much more rapid treatment than otherwise, and the analgesic results have been most satisfactory. Dauriac, of Paris, ⁸⁷⁹ Jan. has found early cases of tarsalgia relieved and even cured by the use of faradism; localized to the peroneus longus, with massage of the other muscles.

In the treatment of gout and rheumatic articular affections, Danion and Revel ²⁴⁴ Apr. reiterate the conclusions of the former, first published in 1887, that electricity in any form is useful, but most so in alternating the induced and continuous currents. Without exception the painful symptoms disappear. The acute stage of the affection is not a contra-indication to the use of the faradic

current, though it may sometimes be for the galvanic. The method tends to prevent relapses and chronicity. In chronic cases (except white swelling), with tendency to relapse, static electricity is strongly indicated. Fibrous exudations and periarticular hypertrophies are especially amenable to galvanism.

Rachitis.—Sagretti, of Rome, ⁷²⁰July in a study of rachitis, concludes that the disease is due to a functional trouble of the trophic nervous system, manifesting itself by a lack of calcareous matter in the bones. Hence he advocates its treatment by hydro-electric baths, by means of which intra-cellular changes are excited and regulated and nutrition accelerated. Tedeschi gives the details of 118 cases thus treated, with most satisfactory results. The whole body being immersed, there is no localized action, but all the trophic centres are stimulated.

Adenitis.—F. R. Labat-Labourdette, of Paris, ¹⁰⁶¹Aug. discusses the action of both the continuous and induced currents in reducing glandular enlargements. The induced current is a molecular shock which awakens and vivifies anatomical elements. Its action is very variable, according to the duration and force of the currents, the rapidity of its interruptions, and the conditions of the skin. It acts indirectly only, by exciting the nerves and producing contraction of the muscles, causing increased nutrition. The trophic action of the continuous current is more energetic, the effect of the induced current being increased and followed by diminished circulation. The continuous current slightly accelerates the circulation, and in cases of inflammation re-establishes it, provided the red globules be not agglutinated. It also imparts energy to molecular changes and stimulates the terminal nerve-filaments, so that exudations disappear within the sphere of their distribution. He recommends the negative pole as the most active. Of 19 cases of chronic glandular enlargements in various situations thus treated, he observed the following results: Cured, 7 cases; improved, 5 cases; cured by electrolysis, 3 cases; improved, 2 cases; electrolysis followed by abscesses with cure, 1 case; failure of treatment entirely, followed by extirpation, 1 case. It is noticeable that one of the cases of improvement by electrolysis was tubercular and that the glands so treated disappeared.

These operations are confirmed by those of G. Labats, of Bordeaux, ¹⁰⁶¹Mar.15 who also recommends the negative pole on the

swelling, an intensity of 10 to 20 milliampères for fifteen minutes at each sitting being employed.

Psoriasis.—Oudin, of Paris, ⁷³ ¹⁵ _{Aug. ; Oct.} reports successful results in the treatment of three obstinate cases of skin diseases by alternating currents of high frequency. The first was a case of psoriasis in a man of 28. This patient had patches of diseased skin on both knees and on his back for five years, which had resisted all forms of treatment. After about three weeks of this electrical treatment only a slight brownish stain on the skin was left. The second patient was a woman of 35, a rheumatic subject. She had had eczema over nearly half of her face for about fifteen years, varying little under treatment. Under the alternating currents there had been slow recovery, the skin becoming intact, with a slight flush marking the position of the old disease. The third case was one of psoriasis of twelve years' standing in a man of 37. This yielded very slowly to the electrical treatment. The usual mode of applying the alternating currents was to put the body in contact with a large electrode and draw sparks from the diseased skin by the other electrode. This was painful if the alternation of the currents was not very rapid, but with very high rapidity the discomfort lessened in proportion as the distance between the electrodes increased.

ELECTROLYSIS.

Arthrodial Disorders.—Electrolysis has been adapted to some comparatively new fields. In fibrous ankylosis, Gwyer, of New York, ⁹⁶ _{Aug.} claims that newly-formed fibrous tissue in joints, caused by traumatism or disease, may be dissolved by either a constant or a fluctuating current. The large electrode of sheet-copper covered with lint is molded to the part with restricted motion and attached to the negative pole; the small electrode is placed on the opposite side of the joint. The current-strength to be employed should be regulated by the age and rigidity of the adhesions, from 12 to 75 milliampères, while the sittings should last from ten to thirty minutes every three days. A detailed statement of cases gives the following results: Case 1, ankylosis following contusion of shoulder. The pain, which had persisted for three months, was relieved immediately; circulation in the hand restored; motion at the shoulder and general usefulness of upper extremity greatly increased. Duration of treatment twenty-five days. Case 2, tubercular disease

of right wrist-joint. Circulation improved; motion and usefulness of hand and wrist greatly increased. Duration of treatment thirty-seven days. Fracture of external condyle, left elbow. Gain in flexion and extension at elbow 42 degrees (123 per cent.). Duration of treatment seven days. Case 4, Colles's fracture of right wrist. Circulation very much improved; motion and usefulness of fingers increased; gain of flexion and extension at wrist 42 degrees (233 per cent.), in lateral motion 23 degrees (255 per cent.). Duration of treatment sixteen days. Case 5, Syphilitic exostosis of left elbow. Gain in flexion and extension at elbow 35 degrees (350 per cent.). Duration of treatment ten days. Case 6, fracture of forearm and injury to elbow. Circulation much improved; gain in flexion and extension at elbow 47 degrees (313 per cent.) after five applications. Duration of treatment eight days.

Tumors.—Much advance has been made in the treatment of new growths by electrolysis, and many encouraging reports are made as to its efficacy in malignant diseases.

Draispul, of St. Petersburg, ¹¹_{Feb.} reports a case of epithelioma of the tongue successfully treated. The patient was a young man of 25, with a tubercular history, both family and personal. He first began to experience cough, pain, and dyspnoea in 1890. An ulcer was seen on the right side of the tongue, which gradually increased in size. A knife operation was refused on account of the condition of the chest. In January, 1892, he came under Draispul's care, the ulcer then being 2.5 centimetres in length and 1 centimetre in breadth, with involvement of cervical glands. There was no syphilitic affection. Electrolysis was preferred to cauterization because (1) of its comparative painlessness, (2) its slight reaction, and (3) its more durable result. A steel needle was connected with the negative pole for ten minutes, and 12 milliampères were used. Destruction was caused in six sittings. At the end of April (three months) the tongue had entirely healed with a thin cicatrix, and the glands had disappeared. Microscopical examination showed the growth to be an epithelioma. Eleven months after operation there was no recurrence. This case is interesting (a) as a case of epithelioma of the tongue in a comparatively young person; (b) from the possibility of a faulty diagnosis, as the youth of the patient, the undoubtedly tubercular condition of his lungs, and the absence of any signs of syphilis were in favor of the tuber-

cular nature of the ulcers, and, indeed, all the medical men who saw the patient thought the affection to be of this nature ; (c) the splendid result obtained by electrolysis until the present ; (d) the more durable result of electrolysis in comparison with the galvanocautery ; (e) the apparent power of electrolysis to act not only upon the parts surrounding the needles, but even at a distance, as has been shown in this case, where the enlarged glands of the neck disappeared as the ulcers were cured by electrolysis. This feature of electrolysis had been mentioned many years previously by Groh, who observed the disappearance of enlarged glands after destroying an epithelioma of the lower lip. Even though the case was tubercular, it would be most interesting.

A case of lupus was successfully treated by Perochand.¹²⁷ Jan. 12



Before treatment.



After treatment.

ANGIOMA OF SCALP. (BERGONIÉ.)
Archives d'Electricité Médicale.

The patient was 28 years of age. No amelioration from injections of various substances nor from electrolysis occurred, but electropuncture, followed by the application of Brocq's mercurial ointment and red oxide, brought about a cure.

A remarkable case is reported by G. H. Fox, of New York,²⁰⁰⁸ which is illustrated in the article on "Diseases of the Skin," vol. iv, Section A. The treatment was similar to that adopted by Bergonié, but by choice of both surgeon and patient extended over four years' time. By this means no deep and permanent cicatrices were formed.

Two very interesting cases of angiomata of the scalp and lip are reported by J. Bergonié, of Bordeaux,¹⁰⁶¹ Jan. 15, Feb. 15 complete

cures being obtained by mono- and bi-polar electrolysis. The first case was that of a man of 50 years, in whom the disease had existed since childhood and had been increasing for the last twenty years. It embraced the whole thickness of the upper lip on the right side, extended from the median line to the commissure, and upward to the naso-labial fold. Twelve sittings were had at intervals during six months, lasting from three to twelve minutes. The positive needle (platinum) was plunged into the tumor, and a current-strength of from 20 to 61 milliampères passed through. Cure was complete and without pain. The second case was an angioma of the hairy scalp in a child of 2 months, the dimensions being 7 centimetres long by 4.5 centimetres wide. Two needles were passed through the tumor at its base, so that the central parts of the needles alone were conductors and were positive. The negative pole was a ring of tin covered with gauze, which embraced the tumor. Twelve sittings (with one interval of two months between the ninth and tenth) were had in five months, each lasting from five to twelve minutes, the maximum current-strength being 90 milliampères, the minimum 28 milliampères. The observer concludes that the bipolar method is more effectual and less painful than the monopolar. (See illustrations.)

Erhoogen, of Brussels, reports ⁸⁶⁸_{Mar. 18} several cases of aneurism successfully treated by interstitial electrolysis. One was a traumatic aneurism of the temporal artery, about five centimetres in diameter. In seven sittings, at intervals of two days, by means of platinum needles attached to the positive pole, the tumor was reduced without leaving any trace of the treatment. In regard to the electrolysis of vascular tumors, the author states that the action of the current is as follows: The radical acid of the salt in solution is carried to the positive pole, where the oxygen is disengaged, while the basic radical flows to the negative pole, where the hydrogen is liberated. Further, if the fluid contain albumen in solution, two different kinds of clot are formed; that at the positive pole is compact, adherent, and tough, while that at the negative pole is soft, flexible, and easily detached from the needle. This fact is important. The positive clot has the further advantage of adhering to the wall of the sac and tending to increase in size by the constant superposition of new plates of fibrin until this cavity is filled. The negative clot remains loose in the sac, and

may be a source of danger. Hence it is unwise to plunge both needles into the sac at once. The needle should be thoroughly insulated, except at the point, lest scars and hæmorrhages occur. The alkaline substances released by the negative pole quickly dissolve the insulating material, and thus a septic material may be introduced into the system. Hence the positive pole only should be used. In order, however, to facilitate withdrawal, the current-strength should be reduced to the minimum, the current changed and allowed to pass for a few seconds. The layer of clot next the needle will then be dissolved, and the needle easily slips out.

In regard to solid tumors, the method devised by Gautier (see ANNUAL for 1893) has proved very successful. This consists, briefly, in the introduction of soluble copper needles, by means of which hydrochloric, sulphuric, phosphoric, and other acids, as well as oxygen, are liberated from the positive pole. These acids, principally hydrochloric, then form with the copper an oxychloride of copper in the nascent state. This is very diffusible, and its diffusibility is aided by the cataphoretic action of the current; so that it is deposited not only in, but around, the tumor, exercising a resolving influence on the morbid tissue. The needles must be pure copper, obtained by electrical deposit from some pure copper salt; commercial copper is impregnated with more or less zinc, which is not diffusible, and exercises a sclerogenic action, which negatives the action of the oxychloride of copper. If the positive pole is used, it need not be rendered aseptic, since it is so in itself; whereas the negative pole, unless previously made aseptic, may give rise to suppuration.

Nasal Spurs.—Meyer, of Berlin, ¹⁰⁶¹_{July 16} reports twenty-three cases of spurs on the septum treated by electrolysis. The method was, after cocainization, to implant two needles of platinum-iridium as near the base of the spur as possible and connect with a battery. A current-strength of not more than 20 milliampères should be employed; with greater strength perforations are apt to occur. No pain is felt unless the spur touches the floor of the nose. Of the twenty-three cases, six were radically cured in periods of from sixteen days to three months, and nine were considerably ameliorated,—that is, nasal respiration was rendered free. The advantages of the method are its bloodlessness, the fact that no dressings are required, that treatment may be interrupted, and that permanent

relief is secured. Meyer simply touches the part with methyl-blue.

BI-ELECTROLYSIS.

This is the term given by Foveau de Courmelles, of Paris.⁶⁷³
It is a method involving (1) the decomposition of the first substance; (2) the decomposition of the second substance; (3) the exchange between the elements which are liberated in a nascent state; that is to say, in their most active condition; (4) the elevation of temperature which is due to the passage of the current, and to the resistance which these two bodies in solution offer.

The mode of action of electrical currents, combined with medicaments, upon the destruction of a morbid product, may be either of two kinds, according to the mineral or organic nature of the morbid product.

1. The action of lithium salts upon gouty nodosities (salts of lime or soda), when associated with the continuous current, is as follows: In a given case the crystals of calcium oxalate or sodium urate are enveloped by an animal membrane, porous and dialytic, and around these crystals a saturated solution of lithium carbonate is placed. The current passes. In a short time a precipitate is formed upon the outer surface of the parchment membrane (calcium carbonate), and the membrane is emptied of its contents. It is in this process, rather than in cataphoresis, that the explanation of a cure lies.

2. The action of potassium iodide upon fat-granules exposed to the continuous electric current is more difficult of demonstration. The fatty mass of a fibroma is not a good electrical conductor in its entirety; for it is formed of molecules imbedded in a muscular and cellular areola, and the injection of the iodide only reaches them by lacerating the tissues, and in this way allowing the current to be conducted to the interior of the mass. Thus, by breaking down these substrata,—these supports of the fat-tissue,—the latter give up their fat-granules; the little nodules, losing their support, fall. Fibromata, therefore, lose their fatty nodules at the expense of the tumor, which gradually disappears. The same thing happens in a lipoma which has received into its mass an injection of iodide, and into which, afterward, the continuous current is passed by means of two needles plunged into the tissues; it is destroyed.

CATAPHORESIS.

Labatut, of Grenoble, ³¹_{July 8} has studied the absorption of lithium salts by the use of the constant current. By experiments on live and dead tissues, he demonstrates that lithium acts as a solvent of uric acid; calculi placed in living tissue lose one-quarter more weight by the use of the current than without it.

Kenelly, of Menlo Park, and Houston, of Philadelphia, ²⁴⁴_{Mar.} reached the following conclusions concerning the physical conditions of cataphoresis: (1) true cataphoresis demands the flow of liquid in the direction of the current, and this depends on producing an engorgement at certain points and a depletion at others; (2) under the current the resistance of different parts changes, and the modifications of current should be symmetrical with these changes; (3) there are two varieties of cataphoresis,—the normal, which induces changes in the constituent elements of the body, and the abnormal, which introduces elements from the exterior.

VIBRATORY MEDICATION.

Vibratory medication finds an exponent in Larat, of Paris. ⁷²⁰_{Oct., '92} The principle on which the vibrators work is as follows: A small Gramme motor, worked by a battery of two elements, bears on its axis a copper weight, which throws the centre of gravity outside the axis. The result of this is that every time the centre of gravity is found above the axis the apparatus tends to rise; while it tends to sink when the centre is below. Hence a movement of oscillation, whose extent, rapidity, and energy can be regulated at will. The vibrations may be used locally, as in neuralgias, or may be transmitted to the entire cephalic mass by means of a proper helmet moved by clock-work. Although good results were obtained, a later idea was to apply the vibrations to the nervous centres, and, to accomplish this, Gautier and Larat have had constructed an instrument closely resembling the form employed to take the shape of the head by hatters. When placed upon the head of the patient the many arms composing it are made to vibrate by a small electric motor on top. The effect is said to be wonderfully soothing to nervous patients, and particularly beneficial in insomnia. The helmet has been used by the author with success in cases of neurasthenia, migraine, psychic troubles, as melancholia and hallucinations, and in a case of Ménière's disease, where vertigo rapidly

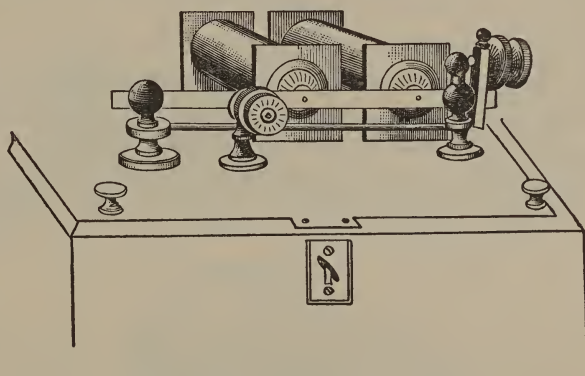
disappeared after the commencement of the treatment, the cure remaining permanent.

ELECTRICAL MASSAGE OF MUCOUS MEMBRANE.

Atorch, of Copenhagen, ⁷²⁰_{Apr.} by means of vibratory mechanism, has succeeded in suppressing the odor of ozæna, and of obtaining an easier detachment of crusts in atrophic rhinitis. In one case even the sense of smell has been regained. By hand-massage one can only obtain eight vibrations per second; with this mechanism fifty vibrations are obtainable. Further reports are awaited with interest.

INSTRUMENTS.

Tuning Rheotome for Electrical Anæsthesia.—Hutchinson, of Providence, R. I., ¹⁸³_{Nov., '92} presents an instrument for working out



TUNING RHEOTOME. (HUTCHINSON.)
New England Medical Monthly.

his theory "that all forms of localized pain, not dependent on structural changes of nerves or nerve-centres, or destructive metabolism of other tissues, may be relieved promptly and effectively, and often cured, by an induced electrical current, whose interruptions are sufficiently frequent and whose strength is small." By means of this instrument the induced current is applied through a vibrator and a wheel, on whose periphery is arranged a series of small, elastic hammers, weighing a few grains each. The wheel revolves by a small motor, the speed being regulated by the pitch of the vibrator, determined by tuning-forks. C major, with 6170 vibrations, was found to be the pitch at which anæsthesia was easiest produced.

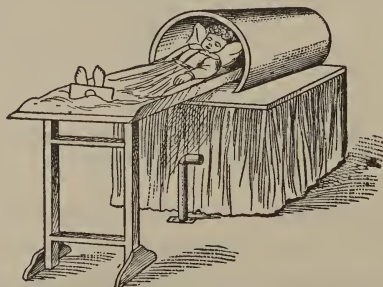
Flexible Electrodes.—Instead of stiff plates, O. T. Freer, of Chicago, ⁵⁹_{Mar.11} uses gold or silver cloth used for trimming uniforms. He sews the band of gold or silver cloth smoothly to the back of the felt or sponge until the entire surface is covered. Then, leaving one end of the band free, he attaches to this a piece of sheet-brass, perforated for sewing, and bent so as to connect with the metal tip of the conducting cord. In this way one can make a better and larger electrode than by means of any clay or animal membrane.

Diagnostic Electrode.—W. M. Leszynsky, of New York, ⁵⁹_{Jan.21}



DIAGNOSTIC ELECTRODE. (LESZYNSKY.)
New York Medical Record.

claims for this instrument the following advantages: 1. All of the connections are completely insulated, thus preventing the accidental closure of the circuit upon the fingers of the examiner. 2. The shape of the interrupting handle adapts itself to the fingers and hand of the operator. 3. The curve in the shaft attached to the "motor point" facilitates its adjustment and manipulation.



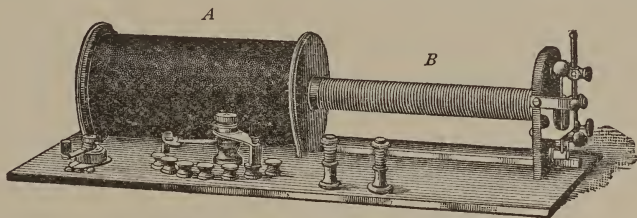
MAGNETIC TREATMENT OF ENTIRE BODY. (WILKINSON.)
Omaha Clinic.

There is a thread cut on the end of the handle where the conducting cord is attached. This permits of a hard-rubber cup being screwed on, which entirely covers the connection. The complete electrode is six and a half inches in length. (See cut.)

General Body Magnetism.—An ingenious contrivance for obtaining the therapeutic effects of magnetism on the entire body is brought forward by Geo. Wilkinson. ¹⁰⁶_{May} The patient is placed

within or in the position of what would be the core of an ordinary horseshoe magnet. The current used is from a dynamo (continuous current) of 110 volts; the ampèreage in the 18,000 feet of winding (No. 20 gauge copper wire) is less than 2 ampères. The magnet-winding is begun on the bar that rises from the basement, is carried up and around the cylinder into which the bed for the patient is pushed, and carried down on a bar into the basement exactly similar at the other end. (See illustration.)

Induction Coil.—A. D. Rockwell, of New York, ^{May 13} has devised an induction coil for utilizing currents of high tension and large quantity by imperceptible gradations from zero to maximum by means of a permanently fixed helix, *A*, with a movable primary coil, *B*. The total length of the coil of this helix is 7552 feet, with the following subdivisions: 696 feet of No. 21 wire tapped at 115 and 580 feet; 2116 feet of No. 32 wire tapped at



HIGH-TENSION INDUCTION COIL. (ROCKWELL.)
New York Medical Journal.

783 and 1335 feet; 4740 feet of No. 36 wire tapped at 1740 and 3000 feet. The heavy coil of No. 16 wire has been discarded, and the No. 21 coil so arranged as to yield a current equal to the No. 16. The merit of this arrangement consists of one's ability to use the whole 7000 feet and more of wire, or to utilize at will each section of the coil with its subdivisions far more readily than when they are wound on separate spools, and, at the same time, to increase the current-strength by imperceptible gradations from zero to the maximum. A large electro-motive force is necessary.

Rectal Electrode.—L. J. Krouse, of Cincinnati, ⁵⁹ _{Mar. 11} presents an instrument by which the metal does not come in contact with the mucous membrane of the bowel. It is composed of two parts, an inner and an outer portion. The inner portion consists of a hollow metal tube, extending almost the whole length of the instrument, the lower end of which is arranged for the attachment

of a Davidson syringe, as well as for a thumb-screw, to which the cord of a battery can be attached. The outer portion is made of hard rubber, the distal end of which is perforated by numerous holes through which the water, as well as the electrical current,



RECTAL ELECTRODE, ONE-HALF NATURAL SIZE. (KROUSE.)
Medical Record.

can pass. The other end is made to screw on to the metal portion. In using this electrode it is always necessary to inject water through the electrode into the bowels, so as to immerse the perforated end ; otherwise the circuit would not be complete, and the patient would not get the benefit of the current.

GYNÆCOLOGICAL ELECTRO-THERAPEUTICS.

By G. APOSTOLI, M.D.,

AND

JULES GRAND, M.D.,

PARIS.

ELECTRICITY VERSUS SURGERY IN GYNÆCOLOGY.

It has appeared interesting to us to unite here some of the opinions expressed upon this subject during the year, either in the medical press or in discussions before medical societies. Favorable or unfavorable, we have reproduced them without partiality and without comment, leaving the reader to draw his own conclusions.

We limit ourselves to stating that, judging from the attitude and tone of the opposing camp, an agreement is not likely to be reached. A little less prejudice and a little more justice on the one hand, a little less enthusiasm and more precision on the other, would without doubt lead to a rational and practical solution of the matter under discussion, and that more quickly and in a manner more favorable to the interests of science and of the patient than these incessant controversies, in which personal motives take precedence of all others.

What is, in fine, the object of the debate? To determine the limits within which the respective resources of surgery and electricity may be utilized in the treatment of the diseases of women. Looking thus at the question, is it impossible to arrive at an understanding that will satisfy the partisans of both sides? In gynæcology, as in other branches, medicine and surgery, instead of being regarded as enemies, should lend to each other mutual support; for each is capable, in distinct but by no means opposite ways, of combining to cure or at least to relieve disease.

It would be useless to claim that by means of electricity surgery is rendered unnecessary in many gynæcological affections. On the other hand, surgery, in spite of the systematic opposition of some of its partisans, cannot prevent electricity from occupying

its rightful place in gynæcology. Of what importance is this place? This is the question to be determined by the present debate. Great or small, it will be what it should be,—a position determined by the results which it achieves.

There is at present an incontestable and marked reaction against the “operative furore.” The contributions of Jules Chéron, of Paris, to the Brussels Congress in 1892, and of Verneuil to the last Congress of Surgery at Paris, have aided powerfully in bringing about this change of opinion, and in reviving a feeling in favor of a more conservative method of treatment. “To suppress is not to cure,” judiciously says Chéron, in raising his voice against this practice of excessive surgical procedures, which he considers as opposed to the spirit of the art of healing. Verneuil, on his side, was the only one among the surgeons of Paris who was not afraid to speak severely of this prodigious abuse, and of the lightness with which operative intervention is undertaken, often by unqualified men. Greatly impressed by the frightful mortality presented by Terrier, surgeon to the Hospital Bichât (30 deaths in 64 abdominal hysterectomies, and 8 deaths in 33 vaginal hysterectomies), a mortality which is, he says, “that of all sincere surgeons,” Verneuil, with the immense authority to which his experience entitles him, adjured his colleagues to renounce a therapeutic measure so mortal in its results; and, in pleading for a more conservative gynæcology, he praised the use of electricity, to which he fully rendered due justice.

Anna Fullerton, of Philadelphia, ¹⁰⁹⁸_{June} reproduces almost entirely the charges usually formulated against electricity by surgeons: among others, the impossibility for the electrician to estimate, by means, the sight, and the touch, his results with an agent so powerful, so subtle, and at the same time so dangerous; the uselessness of electricity in diagnosis as compared with an exploratory incision; want of precision in the formulæ regulating the use of electricity, so that five years of personal effort and an attentive study of the literature of the subject had thrown no light upon it. The applications of electricity at the Woman’s Hospital had all been made by the author herself or her assistants,—one a pupil of Apostoli, another of Mills, and another of Massey. However, the results were such as to show electricity to be unreliable, insufficient, or treacherous; of numerous cases treated, not

one could be considered as permanently cured. Pain and hæmorrhage disappeared, but only during the treatment; inflammatory attacks occurred in spite of all precautions; laparotomy, practiced afterward, showed a marked tendency to the formation of adhesions. As regards ovarian cysts, indeed, the author does not hesitate to state that electricity is a possible factor in their production.

An exceedingly animated discussion took place in the Obstetrical Society of Philadelphia, in September, 1892, between Price, Baer, Hoffman, and McKelway, partisans of surgical methods, and G. Betton Massey, the defender of electricity. The discussion followed a communication by Price on laparotomy for the removal of tumors after treatment by electricity. According to this speaker (an unchangeable adversary of electricity) and those who followed him, the following charges could be brought against electricity: It produces mortification and gangrene of fibrous tumors, the evolution of which is bad after its application, as they become adherent and undergo regressive alteration. Electricity does not arrest the growth of tumors, and by retarding surgical intervention is prejudicial to the patient, causing anæmia and diminishing the chances of cure. A case treated simply by rest and laxatives, and submitted to hygienic rules, will thus be in a better condition than a case submitted to treatment by electricity, and will not be exposed to the degenerative process which takes place in the tumor after electric treatment. The cases so frequently reported as cured are really not cured, and ultimately come to operation, if not already operated on at the moment when the cases are presented before the societies as cases of cure. The results announced are but temporary, and the symptoms re-appear when treatment is suspended. Cases have been operated on in California, and even in Philadelphia, which had undergone prolonged treatment at the hands of Apostoli.

B. F. Baer stated that not only does electricity not cure, but that, by an unhappy coincidence, the most serious cases of hysterectomy and myomectomy in which he operated were those formerly treated by electricity. These tumors were generally adherent; one of them had mortified, another contained a great quantity of pus; others presented traces of old peripheral suppuration. The symptomatic improvement observed after the use of

electricity had formerly been obtained by other means, which acted as well without the inconveniences and dangers of this method.

George I. McKelway regretted that the society periodically lost the time of a number of meetings in the discussion of this subject,—the value of electricity in gynæcology,—a discussion which, on the one side, consisted invariably of allegations, never of proofs; and, on the other, not less invariably, a complete refusal to entertain these allegations. He believed that the method would meet the same fate as the elixir of Brown-Séguard,—that, after a brief period of infatuation, it would fall into complete oblivion.

To meet this opposition and to defend electricity against these charges, G. Betton Massey stated that it did not at all displease him to find himself face to face with so firm an adversary as was Price. He preferred this decided opposition to the attitude of certain surgeons who believed that all methods were good, and that they themselves could make use of any one of them; that they were as capable of handling an agent so delicate and so powerful as electricity, for the cure of hæmorrhagic tumors, as they were to remove them with the knife. It has been ironically stated that electricity may, according to circumstances, determine most contradictory results, sometimes preventing congestion, sometimes causing it, which is true; of being here a stimulant, there a sedative, which is also true. This apparent contradiction is explained by the special action of the poles, and also by the different forms of currents, which, in the hands of an expert, may be adapted in a precise manner to the different conditions most often met with by the gynæcologist. It would be absurd to deny that currents applied in different ways would not produce different and even opposite effects. It is no less absurd to make a parallel between electricity and castration in fibroids.

It appears, from the experience of all those who have acquired the most familiarity with it, that electricity shows itself to be nearly always useful; that is, in almost 100 per cent. of the cases treated. Castration, on the other hand, is no more than an expedient. Of 68 cases of fibroma treated by the speaker by electricity, 64 were manifestly improved. In these 64 cases the development of the tumor was arrested permanently, the pain and symptoms of compression were relieved, and the tumor reduced in size, 7 of them having disappeared. One was as large as an adult head,—this

case having been presented before another society. It is therefore unreasonable to claim that electricity is inutile and uncertain in result.

Massey ⁸¹_{Nov., 192} also read a paper, before the Medical Society of Virginia, upon the modern electric method being preferable to surgery in certain pelvic affections. He dwelt especially upon ovarian affections, fibroid tumors, and uterine displacements. He affirmed that in spite of castration, performed so liberally for salpingo-oöphoritis, the patients rarely improve in health after the operation, not only on account of section of the nerves, adhesions, etc., but because the initial affection—uterine inflammation—still remains. This inflammation precedes the extension of catarrh to the tubes in the majority of cases, and is a very important factor. Direct galvanization of the uterus is indicated, and results in the restoration to society of a woman free from mutilation.

Displacements are the secondary results of microbial infection, and the use of the pessary he regards as an irrational procedure. The treatment which tends to reduce the volume and weight of the organ and to restore to the muscles their tonicity is the intra-uterine application of galvanic and faradic currents combined, which is far preferable to mechanical support in the vagina.

Especial mention should be made of an article presented before the Chicago Medical Society by A. Reeves Jackson, ⁴⁵¹_{July} who endeavors to form a judgment upon the subject, without intruding in any way his personal preferences, but basing himself entirely upon the opinions of those who have taken part in the controversy on the subject. He considers it impossible to form any definite decision owing to the present condition of the debate, the facts upon which such a decision should be based not having been properly considered by either party. The contradictions of the various authors upon the same subject render it most difficult to form an opinion. This continued tendency incites us to admit only such facts as accord with and sustain our own previously-formed ideas. Another difficulty is that, among the authors who have taken part in the discussion, there are those who are notoriously lacking in the most elementary knowledge of the agent whose efficacy they dispute; who are certainly ignorant of the difference between the action of the galvanic and faradic currents, of the positive and negative poles.

In many points surgery and electricity seem to be opposed to each other as regards their value,—as, for instance, in inflammations of the pelvic organs, disorders of menstruation, and ovarian cysts; but there are two points upon which, although the debate is not yet definitely closed, the general opinion seems to accord. These two points are ectopic pregnancy and uterine myofibroma.

EXTRA-UTERINE PREGNANCY.

On the one hand, electro-therapeutists claim the following advantages in favor of their treatment: (1) certain destruction of the foetus; (2) resorption of the dead foetus and the contents of the sac; (3) innocuous character of the treatment; (4) the fact that it does not exclude the possibility of future pregnancy.

On the other hand, the surgeons, who favor radical intervention in the early months of pregnancy, claim that their method possesses the following advantages: 1. All the elements of the extra-uterine gestation are completely removed, nothing being left that could possibly give rise to any future trouble. 2. If any intercurrent affection amenable to surgical treatment complicate the condition, it may be attended to at the same time. 3. As any affection which might give rise to an error of diagnosis would come within the domain of surgery, the operation would still be indicated. 4. The advantages are sufficiently manifest to justify the choice of laparotomy, by the patient as well as the surgeon, in spite of the greater risks which it involves.

We cannot follow the author throughout the various discussions of these propositions by each side, in order to reach the conclusion that the time has not yet apparently arrived when, in a case of ectopic pregnancy before the period of rupture, it can be determined with certainty which is the best course to follow. Two points, however, are settled, and those are that electricity should not be employed (1) in cases of extra-uterine pregnancy of more than four months; (2) in cases where the sac has ruptured. Here, if intervention be attempted, laparotomy should be performed. The discussion is therefore limited to the respective merits of surgery and electricity before rupture of the sac.

The habitual safety of electrical treatment is attested by Thomas, Emmett, Mason, Rockwell, Mundé, Garrigues, Goelet, and others, all of whom have used it successfully.

In spite of the opinion of Jaggard²¹⁴¹₉₀ the danger of rupture of the sac and consequent hæmorrhage is somewhat hypothetical, for no such accident has been shown; at least, in the first three months.

On the other hand, electricity meets with formidable opponents. The opinions of Tait and Bantock are well known. A. W. Johnstone condemns it; as does Wylie, of New York,²⁷_{Jan., '90} and Martin, of Berlin. Joseph Price accuses it of causing adhesions at the point where the electrode is applied to the abdominal wall. If this accusation be confirmed sufficiently often, it will prove not only the failure of electricity to cure, but also that its employment adds to the difficulty and danger of future operation, should this be necessary. J. M. Baldy²¹⁴¹₉₀ cites cases in which errors in diagnosis were made, and he, with several other surgeons, attributes to mistaken diagnosis the disappearance of tumors situated upon one side of the pelvis. He admits, however, the power of the electric current to cause the disappearance of masses simulating extra-uterine pregnancy; and this is precisely what many refuse to admit.

FIBROIDS OF THE UTERUS.

Electricity and surgery seem to compete about equally in the treatment of uterine fibromyoma. The partisans of conservative measures are of the opinion that, in spite of the great frequency of these tumors, it is only in a comparatively small number of cases that they seriously compromise the health of the patients or place their life in danger. It is, therefore, only in the latter class of cases that the two therapeutic measures can enter into competition. Although it must be admitted that a limited number of fibroids call for treatment of some kind, many electricians intervene in every case they meet with. But if electricians are wrong in thus acting, what must we think of surgeons who advise (and execute when possible) serious operations in every case which presents itself?

Electricians claim that under the influence of the current the symptoms—hæmorrhage, pain, and sense of pressure—are relieved; that the tumors are arrested in their development and diminished in size, and that they may disappear. One can expect to do no more, and certainly surgery can do no more. It is but just to say that all electricians do not affirm so much, and that

Apostoli himself is more moderate in his pretensions than some of those who have adopted his method. Upon one point the accord is remarkable,—electricity rarely fails to arrest hæmorrhage. The majority also believe that diminution in size occurs in most cases, but only to a limited degree. As to its total disappearance, while it is possible, it may also be considered as exceptional. J. Wesley Bovee, of Washington; Van de Warker, and Zweifel are among those who believe that the results have been exaggerated. J. H. Kellogg, of Battle Creek, Mich., gives statistics of 60 favorable cases and only 9 failures. Arendt treated 11 cases with success in all but 1, where peritonitis was followed by death. Veit reports 40 cases, in two-thirds of which improvement followed the use of the method.

No one has brought to bear more weight in favor of the method than Thomas Keith, on account of the universal reputation which he has gained by his numerous operations, and his successes with hysterectomy, which no other man has equaled. From his results with electricity in the treatment of fibroid tumors, he does not hesitate to call upon his colleagues to imitate his example and abandon any bloody operation before having thoroughly tried Apostoli's method.

Prochownik was able to arrest hæmorrhage in 50 per cent. of his cases, with or without arrest of development or diminution in size of the tumor.

Martin and Mackenrodt⁶⁹_{No. 2, '92} report 36 cases. After several months of treatment most of his patients were cured of hæmorrhage and some of them of pain; but these symptoms re-appeared when the treatment was suspended. In 40 per cent. of these cases the general condition was aggravated; 3 died during treatment,—1 of anæmia from repeated hæmorrhage, and 2 from septic peritonitis. These authors have abandoned the method; they do not interfere in moderate cases and operate in severe ones. The electrical method does not appear to them to be applicable in many instances. For example, at Martin's sanitarium, of 300 tumors, 53 were cystic or malignant, in 23 cases the uterus was cancerous or pregnant, and in 43 the ovaries and tubes were involved. John Homans, of Boston, has also made an unsuccessful trial of Apostoli's method. He treated 34 patients, with the following results: diminution in volume of tumor, 3; improvement in general con-

dition, 15; aggravation, 2; diminution of profuse hæmorrhage, 9; increase of hæmorrhage, 6; without change, 9; walking easier, 16; more fatiguing, 5; diminution of pain, 5; increase, 3. One patient died of peritonitis attributed to the treatment. The author concludes that the results of electricity are uncertain and cannot be compared to those of laparotomy, by means of which he has cured 14 out of 15 cases operated on for fibrous tumors.

Although we have undertaken the task of giving, without comment, the opinions of different operators, whether favorable or unfavorable to the electrical method, we feel it but our duty to state, apropos of the paper of Homans, that the latter would be unjust in attributing to electricity the mediocre results which he obtained. Careful reading of the cases related by him, especially that of the patient dying from peritonitis, show that the method of treatment employed by the author, and which he sincerely believes to be Apostoli's method, has absolutely nothing in common with the latter, except, perhaps, the instrument; and that there was, on the part of the operator, a veritable abuse of electricity through imprudent and even brutal applications in cases which demanded extremely careful management. In any case, it is impossible, without manifest injustice, to charge such results to electricity, which, skillfully handled, should not produce fatal results.

The following are Jackson's conclusions: The fact that the good effects of electricity have been exaggerated should not prevent us from learning its real value as a therapeutic agent. It appears to be sufficiently demonstrated that it is capable of causing resorption of certain forms of fibromyoma; but, even supposing its power to be limited to producing an arrest of development without diminution of volume, its merits being utilized, it frequently succeeds in arresting hæmorrhage, and sometimes in lessening pain. These points are thoroughly established. It permits of patients performing their daily duties, in cases in which operation is not consented to. On the other hand, the method has the disadvantage of causing the loss of much time, and is not exempt from danger in unskilled hands. Hysterectomy and oöphorectomy expose the patient to greater risks than does electricity; the second is never notably more dangerous than electricity; as to hysterectomy, it is justified only when the disease threatens life, and when nothing further can be hoped from conservative

measures. It should not be an operation of choice, but of necessity.

Kaarsberg³⁷⁵_{v.2,p.146,'92;} ⁶⁷³_{Apr.} treated 20 cases of uterine myofibroma by Apostoli's method; of these, 10 small interstitial tumors were cured. In 2 cases treatment was suspended on account of parametritis. One of the patients died six months after, and at the autopsy numerous small cystic cavities were found, filled with serous material. In 3 cases where the tumor was quite large the symptoms were much improved. Kjorgaard⁹⁷⁹_{v.6,p.1} states that at the clinic of Howitz 22 patients were treated by this method, with favorable results where the tumors were interstitial. In 9 instances hæmorrhage ceased and menstruation became regular. A prognosis could ordinarily be made after ten *séances*. In submucous fibromyoma there was no improvement. In 7 cases the tumor was evidently diminished in size by the treatment. Among the bad effects noted were one case each of periuterine hæmatocele, formation of thrombus, and consecutive embolic pneumonia. Of the 22 patients, 15 were improved, 2 were partially improved; in 2 cases there was no effect at all; in 2 the treatment caused quite dangerous complications. (Report of Corr. Editor Levison, Copenhagen.)

Bergonié and Boursier, of Bordeaux,⁸⁰_{Aug.15} give the particulars of 200 cases treated by electricity, and analyze 100 cases. The positive electrode was used for intra-uterine application, the current varying from 25 to 150 milliampères for ten minutes. Fifty-four of the tumors were very voluminous; of these, 7 were considerably diminished in size; 90 were hæmorrhagic, and in 81 this symptom completely disappeared; 41 were very painful, and in 22 of these the pain became less; in 63 cases there was a general failure of the health, and in these the condition of the patient was markedly improved.

Dufour, of Fécamp, France,²⁰³_{Dec., '92} communicated to the Rouen Medical Society a report of two cases of fibrous tumors treated by Apostoli's method, one of them being expelled entire in the course of the treatment. In both cases the hæmorrhage ceased after the first application, as did the abdominal pain. A current of 150 to 160 milliampères was used.

Decio⁹⁴³_{Mar., Apr.} publishes a memoir in favor of the electric treatment of uterine fibroma. His conclusions, based upon forty-six

cases treated by himself according to Apostoli's method, slightly modified, are that the treatment is superior to all others; that it diminishes or dispels the metrorrhagia as surely as it reduces the size of the tumor.

Swiecicki ⁷⁸³_{Mar., '92} ²⁶_{Nov. 1, '92} gives the results of his experience with Apostoli's method in 38 cases,—13 of fibromata, 11 of profuse hæmorrhage, 9 of leucorrhœa, 3 of amenorrhœa, and 2 of cervical stenosis. He treated his patients twice a week for ten minutes, using a current of 120 to 180 milliampères. The author has completely abandoned the method recommended by Danion (applications of the electrode in the posterior *cul-de-sac*), as this seemed to him to yield positively negative results, except in 1 case where a large ulcer developed at the point of application. In the cases of fibroma he obtained not the slightest diminution in size; of 11 cases of metrorrhagia, 4 were successful, 7 without the least result; 3 cases of leucorrhœa were cured and the 6 other cases considerably relieved; 3 patients with amenorrhœa were cured after four or five *séances*, and 2 cases of cervical stenosis in two *séances*. According to this author's opinion, electrolysis is, at least in gynæcology, only a palliative measure in all diseases except atresia of the cervix; and he believes that one should guard against the enthusiasm of Apostoli and his followers, who seem to ignore or to forget with ease that in medicine *post hoc* does not always mean *propter hoc*.

W. W. Jaggard ²⁷_{Jan.} publishes a case of interstitial fibroid with numerous peritoneal nuclei, and complicated with voluminous abscess of each broad ligament, followed by death from purulent peritonitis. The patient had had for several years repeated attacks of generalized peritonitis and uterine hæmorrhage. She had refused all operative intervention, and even examination under chloroform. Hæmorrhage returning to such an extent as to be offensive, two applications of electricity were made, with the positive pole in the uterus, platinum (75 to 102 milliampères) being used. There was no reaction after the first application, the patient passing the entire day in bed. The next day she got up as usual. Two hours after the second application she was able to get up, but the night following she was seized with symptoms which led to her death five days later. At the autopsy purulent generalized peritonitis was found, with the remains of an old peritonitis and

numerous adhesions between the epiploön and intestines; in each of the broad ligaments there was an abscess containing 3 ounces (93 grammes) of pus; the tubes were inflamed, but not suppurating; there was no trace of ovarian tissue, although the ovarian ligaments could be followed as far as the walls of the abscesses; the uterine cavity was dilated, but there was no indication that it was the point of departure of the infectious process. No communication could be found between the peritoneal cavity and the abscesses, though the infection evidently had its origin there. This case may be compared to that of Homans, previously alluded to. Here, also, electricity was contra-indicated in such high potency, and it is not impossible that this treatment brought on the symptoms observed and caused the death of the patient.

Parsons⁴⁹_{Feb.} related to the British Gynæcological Society a case of total absorption of a large fibroid tumor that he had observed, together with Robert Barnes, in a woman of 35 years. The case was most interesting, the interstitial tumor having reached the level of the umbilicus. After eight intra-uterine applications of the continued current in the space of one month, five positive and three negative, at 50 to 100 milliampères, and the last at 70 milliampères, each treatment lasting ten minutes, the tumor disappeared without leaving any trace, and with it the pain and visceral symptoms from which the patient suffered. The adversaries of electricity, the author states, cannot well in this case claim an error in the diagnosis, which was confirmed by a practitioner of high authority.

The following are the conclusions of an article entitled "Some Successes and Failures with Electricity in Gynæcology," by A. Laphorn Smith,¹⁹_{Jan.7} in which he reports some selected cases from his practice within the past five years: "I have met with one death and two abortions, due to errors in diagnosis. I saved at least twenty women from operation and four from death. I am absolutely convinced that I contributed by the electric treatment toward rendering the operation more easy in cases in which surgical interference became necessary. It is unjust to accuse electricity of favoring adhesions, as my friend Joseph Price and others claim, when they know as well as I that these complications are met with in cases in which electricity has never been used; while in cases in which the treatment for electricity was kept up for a year and

operation practiced immediately afterward, there was a complete absence of adhesions."

CATAPHORESIS.

This has been tried by several authors, who manifest great enthusiasm as to its effects. Croskey ¹⁵¹_{June} believes that by this method he obtained cures three times as quickly as by any other which he tried. He uses sponges soaked in solutions of salt, ergot, etc., in various strengths, introducing them into the vagina. Wallace Briggs ⁹_{June 21} is also of the opinion that cataphoresis gives results superior to those obtained by the curette, injections, cauterizations, bougies, simple electricity,—in a word, to all other measures employed. He makes intra-uterine applications by means of a metallic conductor covered with a thin layer of cotton soaked in appropriate solutions, according to the case, but of which iodine forms the base, combined or associated with such substances as camphor, creasote, etc. The electrode being in place he turns on the current for five to ten minutes, gradually increasing it to the desired intensity. At the same time he moves the electrode from one side to the other of the uterine cavity, the solution being injected drop by drop. He has used this method successfully in cases of metritis, secondary salpingitis, and uterine fibroids.

THE ALTERNATING SINUSOIDAL CURRENT.

D'Arsonval has recently introduced an apparatus, described before the Société de Biologie, the Société d'Électrothérapie, etc., which is capable of developing currents of new forms, and of provoking reactions which, according to the author, are quite different from those customarily obtained by means of the apparatus hitherto known. This apparatus furnishes sinusoidal currents and alternating currents of great frequency. These two forms have been applied in gynæcology by Apostoli, and experimented with in his clinic. The alternative sinusoidal current is the subject of a memoir by Mina Kaplan-Lapina,²⁰¹² under the inspiration of Apostoli and from points furnished by him. This important work is based upon thirty-four unselected cases of fibroid tumors and other affections presented daily in gynæcological practice. The following are the conclusions of the thesis, which but confirm those already formulated by Apostoli at the Brussels Congress in 1892:—

1. The alternative sinusoidal current, applied in the intra-uterine cavity and in the operative conditions described in this memoir, is always harmless, well tolerated, and gives rise to no painful or febrile reaction.
2. Its action upon hæmorrhage is but slight, though it has rather a tendency to cause its continuance.
3. On the other hand, it has a marked action upon the pain.
4. It exerts a beneficial, though not constant, action upon leucorrhœa.
5. It has no action upon hydrorrhœa, occurring in connection with certain cases of fibroid tumors.
6. Its action upon the anatomical regression of fibroids is not yet clearly established.
7. Its action is favorable to the resolution of exudative peritonitis.

HÆMORRHAGES.

Danion ²⁴_{June 29} has studied the pathogeny of hæmorrhage due to uterine fibroids, and attributes it chiefly to the derangement of ovarian function, upon which depends the length and abundance of the physiological uterine hæmorrhage. This derangement of function is caused by the irritating presence of fibromyomata, which destroy the harmony of the generative organs. The circulatory disturbance, the congestion, produced either directly by compression or indirectly by reflex vasomotor action, and endometritis itself, are, according to this author, but secondary factors in the loss of blood. They act not as cause, but as effect. It is true that, once established, endometritis becomes a powerful auxiliary; it does not, however, precede, but merely follows upon the functional deviation of the ovary, upon which depends the metrorrhagia and menorrhagia.

This theory, which is in opposition to generally admitted ideas, was opposed by all the members of the Society of the Ninth Arrondissement of Paris who took part in the discussion of the paper. As regards the treatment of these hæmorrhages, faradization and galvanization have a marked action. The former possesses but a temporary influence, while the galvanic current has a permanent curative effect, owing to the profound changes which it produces. Danion believes that the hæmostatic action of electricity is entirely independent of its caustic action, which he believes would be injurious and would prevent the good effects of the dynamic influence by causing symptoms of congestion and painful tension, obliging the patients to keep their bed; it might also

be capable of inducing a hæmorrhage more serious than the one which it was intended to combat. He is therefore altogether opposed to intra-uterine electro-chemical procedures, which he regards as an error prejudicial to the progress of electrotherapy. It is to the dynamic action exclusively that the hæmostatic action of the current should be attributed, and consequently he recommends vaginal or intra-cervical applications only, with interruption of the current, to the exclusion of intra-uterine applications.

An entirely opposite opinion is sustained by Goelet, of New York, ¹⁹_{Aug. 12} in a communication upon the causes of failure in the electrical treatment of uterine hæmorrhage. According to this author, hæmostasis is obtained principally by the scarification of the uterine mucous membrane when brought into immediate contact with the positive electrode. Under the influence of the oxygen, chlorine, acids, etc., disengaged by this contact, the uterine tissue is destroyed and forms an eschar which prevents any further flow. One of the most frequent causes of failure is imperfect and insufficient contact of the electrode with the entire surface of the endometrium, either from defective application or from a special formation of the uterine cavity. In some cases, for instance, when the cavity is enlarged and irregular, and the platinum sound becomes insufficient on account of its small size, the latter may be advantageously replaced by the series of charcoal electrodes, the diameter of which gradually increases, and which may be exactly adapted to the size of the cavity, the entire surface being successfully cauterized.

ELECTRICITY AND DIAGNOSIS IN GYNÆCOLOGY.

Apostoli presented to the French Society of Electrotherapy a communication upon this subject, ²⁴_{Nov. 20, '92} calling attention to it as being of especial interest to surgeons, "who frequently open the abdomen to make a diagnosis, practice unnecessary mutilations, operate for fibroma instead of salpingitis or ovarian cysts, and *vice versa*." As conservative gynæcology has found in electricity a most precious auxiliary, surgery in its turn will find in the same agent an exact and faithful guide in elucidating, confirming, or rectifying a doubtful diagnosis; in indicating or hastening an operation in cases in which the necessity does not from the outset appear inevitable, and prescribing in other cases surgical intervention

which would be superfluous, inutile, or dangerous. Electricity, in a word, will put an end to uncertainty of diagnosis, which has until now justified the mania for the so-called exploratory laparotomy, the source of surprises too often irreparable. Two questions of vital interest, and most difficult to solve, daily present themselves in gynæcology: Are the appendages diseased? If so, what is the degree of inflammation, and is pus present? Bimanual exploration being generally insufficient to solve these two problems, electricity must be brought to aid in their solution; and, before having tried this new method of examination, exploratory laparotomy should be relegated to the same position as castration practiced either for rebellious so-called ovarian pain when this is amenable to electrical treatment, or for lesions of the appendages of doubtful nature.

The faradic and galvanic currents may, either singly or successively, aid in determining the nature of disease of the appendages. No gynæcologist has any longer the right to be ignorant of the remarkable efficacy of the faradic current in so-called ovarian neuralgia of hysterical origin. Its result is so constant that in case of failure it is safe to conclude that there exists a concomitant inflammation of the appendages demanding either supplementary electrical treatment or operative intervention. Here, then, is a precious element in diagnosis, furnished by the electric current, which thus acts as a test as well as a curative agent. The demonstration, by means of the galvanic current, of ovarian reflexes and of salpingitis, will be conclusive, and will determine with mathematical precision whether the uterine periphery is the seat of suppurative inflammation, requiring future surgical intervention, or whether, in the absence of all inflammatory lesions, the case is one within the domain of conservative gynæcology.

In simply hypertrophied or fibroid uterus, with or without accompanying endometritis, inflammatory lesions of the appendages or the pelvis, intra-uterine galvanization according to the rules of antisepsis, in strength of 100 to 150 milliampères, is always absolutely harmless, almost always well supported, and is never followed by painful or febrile reaction the day after treatment or the days following. All suppurations in the pelvis, and particularly acute inflammation of the ovaries or tubes, predispose to considerable post-operative reaction following galvanic applications. The

sensitiveness of the uterus to the continuous current is therefore, before all, vassal and tributary to that of the appendages. The absolute tolerance of the uterus indicates that its periphery is healthy, its intolerance increasing according to the degree and acuteness of inflammation in the appendages. This is proven by the varying degree of tolerance of the uterus in certain cases for the same strength of galvanic current, and also the variations in the same patient, of this tolerance, according to the condition of the appendages; for, if one uterus supports the treatment well when its periphery is healthy, another, on the contrary, will show an increased or diminished intolerance according to the intensity of the inflammation in the appendages. Experimental proof of this fact has frequently been furnished by cases in which the uterus, intolerant before castration, recovered after operation a tolerance nearly identical with that conferred by physiological integrity of the appendages.

The post-operative reaction which shows itself after galvanic applications must not be confounded with the intolerance, sometimes quite great, manifested by certain patients toward the electric current. This intolerance is especially marked in hysterical subjects. It has nothing in common, in the eyes of an experienced observer, with the real pain—intense, though often mutely borne—experienced by women in whom the uterine periphery is diseased. This pain may occasionally show itself during the passage of the current, even in the absence of all peripheral complications; but in these cases it disappears immediately when the current is interrupted, or at least very soon after the treatment is discontinued. On the other hand, the true galvanic reaction may not show itself during the course of the *séance*, often beginning only the day after. The severe pain which characterizes it is ordinarily accompanied by chills, fever, nausea, etc., and compels the patient to remain in bed. It persists from two to four days or longer, with an intensity generally proportionate to the acuteness of the inflammation or suppuration of the appendages. This galvanic test may, however, provoke accidents; this one must have the courage to say, and to say with emphasis, to impress upon the reader the necessity for circumspection and reserve, in order to avoid these accidents. But is it a reason for us to renounce in every case the use of an agent of such incontestable utility? By

no means; since, by its very activity, it constitutes a valuable control agent,—a reagent of great sensitiveness, a real touchstone,—compelling prudence and awakening the clinical skill of the physician, in order that he may adapt to each case the dose, the pole, the number of *séances* suitable, and recalling to him that he must respect in each instance susceptibility and the tolerance of the patient.

The following rules, thoroughly understood and faithfully observed, will insure the certain avoidance of all serious complications: (a) Begin all intra-uterine galvanic applications with the positive pole. (b) Never apply in the first *séance* a strength greater than 50 milliamperes, and never, at first, exceed the dose tolerated by the uterus. (c) Make the first galvanization slowly, with circumspection and gentleness. (d) At once interrupt the *séance* as soon as there are any manifestations of intolerance, and renew it in two or three days when all reaction has subsided. (e) Do not increase the intensity of the current or the length of the *séance*, except in proportion to the degree of tolerance manifested in the preceding *séances*.

These applications being well tolerated, if it is possible without causing operative reaction, and especially post-operative reaction, to increase the strength to 100 or 150 milliamperes, the appendages are in good condition, or, at least, they are not the seat of actual inflammation or suppuration. When the initial intolerance of the uterus grows less with the number of applications, the symptomatic amelioration being also marked and increasing with time, the case is hysterical or else the disease of the appendages is diminished or arrested.

If, on the contrary, the galvanizations, in spite of the precautions indicated, with a current of 50, 30, or 20 milliamperes, awaken great susceptibility; if they be followed by painful or febrile reaction the following day or days; if this intolerance for the weakest current develop and increase with each *séance*, though these are repeated with moderation and prudence,—then the uterine periphery is the seat of a lesion not amenable to conservative gynæcology. All galvanic treatment should be suspended, and the patient advised to undergo an operation.

HYDROTHERAPY, CLIMATOLOGY AND BALNEOLOGY.

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HYDROTHERAPY.

THE past year has been fruitful, in the development of this branch of therapeutics, not so much in the quantity of the literature as in its quality. Eminent teachers in this country have spoken plainly and warmly of its advantages, and the *rationale* and *technique* have thus been placed within reach of large numbers of young and inquiring medical minds. The occasional prominence of water as a remedy, as in the days of Antoninus Musa and Asclepiades, Floyes and Hufeland, Currie, and others, and its subsequent fall from favor, would have been fatal to its reputation were not the reason readily found in the lack of precision in *technique* and the total reliance upon clinical evidence to sustain its claim. Such evidence, even if reliable, which is rarely the case, is insufficient, if a plausible *rationale* of the effect of a remedy cannot be given.

This is precisely the hopeful sign of the times, namely, that physicians no longer laud the virtues of water, but offer a rational explanation of its effects. Hoffmann, of Leipzig; Semmola, of Naples; Erb, of Heidelberg; Dujardin-Beaumetz, of Paris; and Horatio C. Wood, of Philadelphia, are all advocates of hydrotherapy. This last writer holds ⁸⁰_{Sept., '92} that the espousal of water as a remedy by empirics is to-day mainly responsible for the aversion of many physicians to its adoption. He asks, "Are we just to ourselves or to those who intrust their lives and health to our keeping in maintaining this attitude? Is it not rather our duty—nay, our happy prerogative—to carefully scrutinize, by modern methods of research, the past history of the application of water in disease, to ascertain the defects arising from its empirical

use, and to wrest from the quack a weapon against disease whose power stands second to none in the catalogue of therapeutic agents ? ”

Among the causes operating against the more general adoption of hydrotherapy as a remedial agent, none has been more potent than the lack of exactness in *technique*. Procedures have been reported in so indefinite a manner that a resort to them by others has either been unsatisfactory or negative in result. The principles of hydrotherapy must be kept constantly in view. That the intelligent application of cold stimulates, of warmth depresses, is an axiom of Hippocrates. A brief application of cold invariably stimulates in accordance with the reactive capacity of the patient. The senseless prolongation of cold depresses, until even death of the part ensues. A measure so powerful for good, when rightly used, must be a valuable remedial agent if in its application the varying effects of temperature are carefully regarded. In an article on hydrotherapy in nervous diseases, Frederick Peterson^{5 Feb.} holds that we do wrong not to properly investigate this agent.

Hot Baths.—The effect of hot bottles upon the excretion of nitrogen is discussed by Formanek,^{844 Mar.12} who ascribes the conflicting results hitherto obtained to imperfect methods and individual differences. He insists that hot baths invariably increase the excretion of nitrogen, and also cause an increase of white blood-corpuscles.

Baelz, of Tokio,^{2023 p.401} writes concerning the baths of Japan. Here these are taken at a temperature as high as 106° F. (41.1° C.), causing a rise of temperature as high as 104° to 106° F. (40° to 41.1° C.). This is due not to the storing up of heat, but to its absorption. The pulse is increased, and the vessels become dilated and lose their elasticity. Hot baths do not weaken or depress the patient or render him liable to take cold, as does the warm bath (98° F.—36.7° C.—or less). On entering the hot bath, hot water must be poured on the head to prevent cerebral anæmia. The hot bath is a derivative indicated in capillary bronchitis and lobular pneumonia. Three or four general baths should be given daily. It is also of use in rheumatism, nephritis, and at the onset of menstruation, when there is uterine colic. Baelz affirmed that at the baths of Kusatsu, where the water contains sulphates and chlorides, the Japanese took daily five baths of three minutes’

duration, at a temperature of 129° F. (54° C.). After six days an exanthem is produced, which resists all treatment, but eventually disappears spontaneously. The baths at Kusatsu are used in the treatment of severe chronic rheumatism, of gout, and of obstinate syphilis, as well as of leprosy.

Intestinal irrigation in dysentery is warmly recommended by Quinn,⁵⁸_{July 1} who used $\frac{1}{2}$ gallon (2 litres) of water as hot as could be borne by the hand, washing the bowel clean, and repeating the irrigation on the return of the symptoms.

McConnell⁵⁹_{June 17} advocates, in the treatment of infantile diarrhoea, hot water internally, administered by means of the nursing-bottle. Although at first vomited, it is afterward retained, and its use is followed by good results. It was suggested to the author by the benefits observed in adults from rendering the alimentary canal antiseptic.

Abel Françon²¹¹_{Mar. 12} describes the methods adopted at Aix-les-Bains. Here massage is combined with hot douches in the treatment of sciatica, six severe cases of which the author reports as cured. Aix-les-Bains commands a supply of four million litres (quarts) per day at a temperature of 44° and 45° C. (112° to 113° F.), which temperature may be lowered by means of cold water. After a thorough sweat-bath the patient is given eight or ten minutes of massage, avoiding at first the painful parts, followed by a douche as hot as indicated. He is then placed on a couch for an hour's repose. The author gives the following *rationale* of the method: The sweating and abundant hot douching during massage produce a very marked dilatation of the superficial vessels, evident from the reddened skin, bringing the blood to the periphery. The massage stimulates the lymphatic system and facilitates the flow of blood in the capillaries and consequent absorption.

The Turkish bath is condemned by W. Smith⁹⁹⁶_{June 25} in tuberculosis, because it increases tissue-change, produces loss of flesh, and diminishes the resistance of the organism.

Reclus¹⁷_{May 4} describes a combination of hot baths with massage and electric bandaging, in severe sprains, by which he has cured cases in a few days. He regards hot water as superior to cold for immersion. Hot irrigations of the colon are warmly advised by Forer¹⁴⁸_{Jan. 25} for renal colic, ovarian neuralgia, phlegmon of the broad ligament, dysmenorrhœa, and hepatic colic. This procedure has

often given great relief in cases in which the pain had proved rebellious to the action of morphine. Besides a palliative effect, this measure has seemed, in certain instances, to have possessed an active antiphlogistic effect, and to have greatly relieved congestion. The patient—in Sims's position, using the right hand—may, in case of need, apply the treatment herself. The temperature of the water is 41° to 44° C. (106.8° to 111.5° F.), the quantity varying from $\frac{1}{2}$ to 1 litre (a pint to a quart).

Daggett¹⁷⁰_{Sept.} advocates the treatment of urethral disease by posture and a continuous current of hot water,—a valuable but much-neglected method. The value of the Scotch douche in chronic rheumatic joint trouble is emphasized by Max Schueller.⁹⁴⁶_{'92} This consists of quickly alternating jets of hot and cold water, and should always be used after warm baths. Even in seemingly hopeless cases it proved useful in restoring helpless joints.

Remarkable results in the treatment of chronic nephritis by daily warm baths (100° F.— 37.8° C.) are reported by Florian⁴¹_{July 20} and by Simon Baruch.⁵⁹_{Feb.} In a case in which retinitis was present, great success followed the use of hot-blanket packs, succeeded by cold ablutions. The warm baths last one-half hour, when the patient is wrapped in dry blankets for another half-hour. Beni-Barde¹⁴_{Aug. 30} advises the hot douche in the treatment of the dermatoneuroses. Lichen planus is successfully combated by a douche of 95° F. (35° C.) lasting from three to six minutes, and given in the form of a large, fine spray, the patient being afterward gently dried and rubbed. Hip-baths and perineal douches are sometimes useful. Rose⁵⁹_{Oct. 29, '92} regards the permanent warm bath as of great value in articular inflammation, and quotes Hueter as stating that it is the most efficacious measure in polyarthritis.

To produce sleep in nervous diseases, Peterson⁵_{Feb.} advocates the prolonged warm whole bath, at a temperature of 70° to 90° F. (21.1° to 32.2° C.), and lasting from one-half to two hours. As a general hypnotic agent, however, applicable to all forms of insomnia among the insane, the hot wet pack stands foremost. The good effects of hydrotherapy in maniacal cases is astonishing. For the erethic forms of hysteria, wet packs of 60° to 70° F. (15.6° to 21.1° C.) for one hour or more are indicated, followed by massage (Putnam-Jacobi); or the rain-bath, from 65° to 75° F. (18° to 23.8° C.), for thirty-five seconds daily, at twenty pounds'

pressure (Baruch). For the depressed type the hot-air bath is indicated, followed by rain-bath for thirty seconds at 85° F. (29.4° C.), daily reducing until 60° F. (15.6° C.) are reached; this to be followed by spray douche for five seconds, at 65° F. (18° C.), or jet douche for three seconds at 65° to 55° F. (18° to 12.8° C.), gradually reducing to 50° F. (10° C.) or less, and increasing the pressure from two to thirty pounds (Baruch).

For incontinence of urine in paresis of sphincter or detrusor brief cold sitz-baths daily (56° to 64° F.—13.3° to 17.8° C.), one to five minutes, rain-baths (50° to 60° F.—10° to 15.6° C.), and douches, as general tonics, are recommended. In locomotor ataxy hot-air baths to lower extremities, followed by affusions or douche (60° to 70° F.—15.6° to 21.1° C.), are advised (Hoesslein). Neuralgias of all types, especially tics, are benefited by hot-air baths to perspiration every other day, followed by gradually-lowered douches (Baruch, Duval). Peterson insists that precision of method is absolutely essential, as much care being necessary as in the prescription of drugs; for any violation of the principles or neglect of the modes determined by long experience is certain to be followed by unfortunate results.

In the therapeutics of the degenerative diseases of the spinal cord Curran Pope,⁹⁰⁶ of Louisville, Ky., claims that hydrotherapy offers the greatest chances of success. He never allows patients to take baths at home, since the results are not satisfactory. Canova¹⁰⁰¹ has obtained much success from the use of hydrotherapy in tabes. He warns against low temperatures and long continuance of the treatment. Mueller⁶⁸ regards a rationally-directed water treatment as the best in nervous disease.

Cold Baths.—Draper⁵⁹ read an interesting paper before the New York Academy of Medicine upon hydrotherapy, internal and external, in which he claimed that the method was useful in all disturbances of innervation depending on or co-existent with instability of the vasomotor system. In cases in which the nutrition has been enfeebled by chronic disease, such as catarrhal and rheumatic affections, by emotional shocks, or by alcoholic and venereal excesses, and in the protean derangements caused by so-called neurasthenia or spinal irritation, in hysteria and hypochondriasis, the good effects of the cold bath are very striking. It seems to be more effective than any treatment by medicines, stimulating the

nerve-centres, restoring the equilibrium of the circulation, and reviving the activity of the organic functions. The application of the cold bath requires much discretion and trained intelligence. Its best results require the appointment of a well-ordered establishment, where all the various methods of applying cold by means of water can be wisely and skillfully directed. It is probable that the methods of application are of less importance than the judicious regulation of the temperature and the duration and frequency of the baths.

Baruch,^{59 Feb.} in a paper read before the New York County Medical Society, on water in intractable disease, gives the history of cases referred to him for treatment after all other methods had failed. Among these were cases of intense chlorosis, nervous dyspepsia, diabetes and obesity, sexual neurasthenia, angina pectoris, phthisis, chronic and acute nephritis, jaundice, epilepsy, and hysteria.

The author endeavors to show that we possess in this method a valuable auxiliary to methodical treatment of many, though not all, acute and chronic diseases. No case should be given up as hopeless until hydrotherapy, in some form, has been tried. His observations at the Montefiore Home, which receives only incurable cases, demonstrate its value, and also that the treatment is free from shock or other unpleasant features. Baruch claims that clinical evidence of its value in phthisis is accumulating. He reported to the State Medical Society last February a case, aged 33, of a year and a half's duration, beginning with pulmonary hæmorrhage, which gained twenty-six pounds in three months, and coughed so little that no specimen of sputum could be furnished; another, 36 years of age, ill two years and a half, beginning with hæmorrhages, gained twenty-one pounds, lost all bacilli from the sputum, and returned to work; another, aged 31, ill one year with repeated hæmorrhage, night-sweats, etc., gained in weight, the bacilli disappeared, and the physical signs diminished so that the patient was able to work. All these cases were observed in hospital. These results should lead physicians to try the method before sending their patients elsewhere, there being a reasonable prospect of success in home treatment.

Ransom^{59 Jan. 21} contributes a review of the uses of the douche, the success of which depends upon the ability to control and direct

the forcible impact of water upon the whole body or any part of it, this control being absolute as to the force, temperature, duration, and form of the douche.

S. Weir Mitchell⁵⁹_{Dec. 24, '92} refers to the dripping sheet as the most valuable hypnotic in insomnia of patients subjected to the rest-cure. Podzhradsky, of Baden,¹⁰⁰¹_{June} writes upon the value of cold hydrotherapeutic measures in the treatment of chronic articular rheumatism, previously under the hot-springs treatment. He advises cold applications to counteract the debilitating effect of the warm bath, beginning with a mild temperature. In chronic muscular rheumatism and neuralgias he also has observed brilliant results. In a paper on hydrotherapy in chronic joint rheumatism by Winternitz,⁹⁰⁶_{July} an attempt is made to prove that the treatment is rational by showing beyond doubt that cold water and thermic and mechanical agents are capable of influencing the infectious process itself. They exert a most powerful influence on the different organic functions, on the innervation, the circulation, and on tissue-change, and exercise most powerful tonic effects. The acidity of the urine is greatly increased by this treatment. Winternitz, in the same article, recommends the use of the faradic current in anæsthetizing the skin over painful joints, thus rendering it possible to carry out any necessary hydiatic measures without subjecting the patient to pain.

The so-called excitant wet compresses are also of value in joint affections. They are made of the finest old linen, wrung out of quite cold water, and applied to the limbs; a bandage of wadding is loosely fastened over them. These remain undisturbed for three or four days, only the wadding bandages being removed, so that water may be dropped on the bandages from a sponge and kept constantly moist.

Winternitz does not approve of warm baths in these cases, nor in gout. Rubino¹⁰⁰¹_{June} recommends hydrotherapy in the treatment of gout, but not, however, during the attack. Simple or mud baths and douche at a temperature of 95° F. (35° C.) and upward are advised.

Horatio C. Wood, of Philadelphia,⁹⁰⁶_{July} makes an important contribution upon the value of baths and exercise in contracted kidney. A. Jacobi, of New York,⁵¹_{Apr.} highly recommends cold water in the treatment of pneumonia in children. Baruch⁵¹_{July} has pointed out

the danger of cold baths to infants with pneumonia, unless the technique be exact. Observations made by him in New York City show that in December the Croton water has a temperature of 45° F. (7.3° C.), while in August it is often 75° F. (23.9° C.). Baruch uses baths of 95° F. (35° C.), reduced not lower than 80° F. (26.7° C.), for from ten to fifteen minutes, with friction. This plan is approved of by Baginsky and Penzoldt, and also by Hutinel. (See ANNUAL, 1893.)

Mays⁹⁰⁶_{May} advocates the use of the ice-poultice in croupous pneumonia. He surrounds the affected area with rubber ice-bags well wrapped in towels and places another on the head. How much of the good result claimed is due to this treatment and how much to the large dose of strychnia (over $\frac{1}{2}$ grain—0.03 gramme—daily) and morphia is a question to be decided. Leeds²_{Feb.} has tried the ice-bag in pericarditis with much success. Talamon⁹⁰⁶_{Mar.} recommends, in the treatment of scarlatina with prolonged hyperpyrexia, the systematic use of cold baths according to the method of Brand.

Typhoid Fever.—Thayer, of Baltimore,⁷⁶⁴_{Apr.} confirms the opinion of Winternitz and Rovighi, that cold baths produce leucocytosis. Baruch,⁹⁰⁶_{June} in a discussion of this article, shows the treatment of typhoid fever by means of water to be thoroughly in accord with modern ideas. Sihler, of Cleveland,⁹_{Nov. 19, '92} proves that the opinion formerly held by Osler, that the Brand method was not feasible in private practice, is without foundation in fact. Osler himself, indeed, has since rescinded this view.⁹_{p. 622, '92} Sihler advises that the physician be present during and after as many baths as possible, to properly instruct one or more suitable persons as to the method of giving the baths, and to insist upon its importance to the patient himself. Brand's method should be implicitly followed, without any attempt to improve on it, until long practice in its use warrants him in doing so. J. C. Wilson,⁹_{Nov. 26, '92} gives statistics of the treatment at the German Hospital in Philadelphia, based on a sufficient number of cases and extending over a sufficient length of time to warrant conclusions as to the efficacy of the method in an American hospital. The death-rate is shown to be reduced 50 per cent. from the best showing of previous years, and 66 per cent. from the most favorable statistics of the city under other methods. Gilman Thompson, of New York,⁹⁰⁶_{Aug.} gives his personal experience in the use of baths for typhoid fever. He found the bath at 75° F.

(23.9° C.) endurable, but that at 65° F. (18.4° C.) very uncomfortable. The temperature was reduced very little, but there was immediate relief from general aching and muscular pain. The after-effect was so soothing and the favorable influence upon all the symptoms so pronounced that the temporary discomfort was easily endured. Delirium did not occur, and the digestion was excellent. He found that close attention to minute details added greatly to the comfort. There was less shivering when the back was vigorously rubbed as soon as the water was entered, and he believes that friction should be constantly and vigorously maintained over the entire body, which is easily turned if completely immersed in the water. Ten years of "expectant" treatment among 1305 cases in various New York hospitals showed a death-rate of between 20 per cent. and 30 per cent. (Delafield). By the Brand system the mortality of typhoid fever, in both the New York and Presbyterian Hospitals, has been reduced to 7.5 per cent.

CLIMATOLOGY.

Moeller¹⁵³_{Apr. 27} states that the climatic peculiarity of a locality depends (1) on its situation more or less distant from the equator; (2) on its altitude above the sea-level; (3) on its nearness to a sea, lake, hot desert, or cold plain; (4) on the nature of the prevailing winds; (5) on the configuration and composition of the soil; (6) on vegetation and the condition of agriculture.

Bleyer⁴⁵¹_{Aug.} recommends that a patient reverse, as far as it is advisable, the nature of his ordinary climate when a change is necessary. If he is from the north, let him go south; if he is from a mild climate, let him seek a bracing one. In the selection of health resorts, Mitchell, of Asbury Park,²⁵¹_{Feb.} strongly urges the necessity of ascertaining the sanitary status of the place, as well as its climatic peculiarities. The air, water, and soil provided by nature may be poisoned by leaking cess-pools and drains, wet and musty cellars, or contaminated wells.

Marten, of Adelaide, South Australia,⁶_{Mar.} and de Witt, of Cape Colony,²_{June 24} protest against the "indiscriminate shipping" of phthisical invalids to the colonies. They generally arrive there in January or February, with the thermometer at 104° to 105° F. (40° to 40.6° C.). On the voyage they are shut up for ninety or a hundred days, surrounded by fellow-passengers in all stages of

phthisis. Patients leaving home with only slight signs of trouble often arrive, at the end of the long voyage, in such an advanced stage of the disease that their lives can be prolonged only a few dreary months, away from friends and without comfort.

It is also questioned in an editorial²⁶_{Nov. 1, '92} if the constantly-growing custom of sending patients to far-distant health resorts has not become too general. All ordinary comforts and necessities for the invalid away from home are expensive; and, if one has to be content with small rooms, high up and having a northern exposure, all the bright sunshine out of doors will not counteract the bad effect of the dull hours passed in the house.

Ford, of Utica,⁴⁵¹_{Feb.} emphasizes the necessity of co-operation on the part of the patient in climatic treatment. The element of change can be considered solely in its relation to the mental impression it may make on the patient. If this be favorable, then the result will be favorable on his general health. Ford also recommends that patients with limited means in our northern climate try hospital treatment for pulmonary troubles, rather than undertake a long journey far away from home and friends.

At the Dorpat Medical Society,²¹_{Feb. 28} Robert Koch favored suitable sanatoria at home for consumptives rather than distant watering-places. He stated that, even in the Jura Mountains, at an altitude of 3500 feet, tuberculosis is just as common as it is in Berlin. For him the principal factor is pure, aseptic air; and wherever that can be found, together with suitable medical attendance, that is the place where such patients should be sent.

An interesting work on mountaineering, by Claude Wilson,⁶_{Aug. 12} demonstrates how popular this healthful sport is becoming. The author treats of its dangers as well as its pleasures, and shows how to avoid unnecessary dangers and how to prepare against the unavoidable ones. It is best to eat freely on the way up, and to drink as little as possible between meals. Drinking glacier water is to be avoided. (*Vide* ANNUAL, 1893.)

De la Harpe²_{Apr.} divides altitudes into three classes: (1) the "subalpine" zone, from 700 to 1300 metres; (2) the "alpine," from 1300 to 1900 metres; (3) the "hyperalpine," from 1900 metres up. The subalpine zone is considered the most suitable for cardiac affections, atheromatous changes, and excitable subjects; while a higher altitude gives excellent results in tuberculosis,

anæmia, and neurasthenia. It takes a week for the traveler to become acclimatized, during which time the appetite increases, great thirst is felt, respiration and pulse are increased in frequency, and blood-pressure is diminished. After several days all the functions become normal, except that the respirations increase in frequency and the blood is found to contain more red blood-corpuscles.

Egger⁶_{Oct. 22, '92} attributes the improvement in phthical patients at high altitudes to this increase in the number of red blood-corpuscles. Remondino, of San Diego, Cal.,²⁰²_{Feb. 10} ably presents the other side of the question. He claims that too much stress is laid upon the beneficial effects of high altitudes.

In a discussion at the American Climatological Association,⁷⁹_{July} Darlington expressed the belief that climate does not exert any great influence on pulmonary tuberculosis. Oregon, with a great rainfall, is more healthful than dryer California. Bell, of Brooklyn, repeated his views on the influence of ocean atmosphere, and cited Turk's Island, almost at the level of the sea, where the ratio of deaths from pulmonary consumption is smaller than that of any place of similar population; but the chief attribute of an ocean atmosphere is, in his judgment, its clearness.

The pine-region of New Jersey is described by Platt, of Lakewood.²⁵¹_{Jan.} The soil varies from light, sandy loam to an almost pure sand. The region is sterile and vegetation sparse, consisting mostly of pine. The soil is so light and porous that it is capable of retaining but little moisture. It has been shown by H. I. Bowditch, who is confirmed by Simon and Buchanan, of England, and by Pepper, of Philadelphia, that there is a direct relation between damp soil and the prevalence of consumption. The rich, moisture-holding soils are particularly favorable for the growth of vegetation, as well as for its decomposition, and for the production of the pabulum upon which organisms thrive. Therefore, the air of such regions must be impure, while the air of sterile regions and of the sea, where there is no vegetation, is comparatively pure. It is not dampness *per se* which causes disease; but dampness under such conditions as to produce rank vegetation and the decomposition of organic matter.

Bell⁷⁹_{May} characterizes the climate of South Carolina as dry. Aiken is surrounded by pine-forests, whose extreme dryness is due

to natural drainage, accomplished by decay of the roots of trees, leaving holes and tunnels whose ramifications form a net-work of natural-soil drains, which are as effective as pipes for carrying away the surface water.

Taylor¹⁰⁵_{June 1} and Walsh²²²_{June} speak in high terms of Asheville, North Carolina, which is situated 2350 feet above the level of the sea, on a plateau encircled by mountains. The mean summer temperature is 65° F. (18.3° C.); that of the winter is 49° F. (9.4° C.). West North Carolina has an average of twenty-four sunny days per month. The "Winyah" is a fine sanatorium, conducted by von Ruck and modeled after institutions in Germany, especially those at Falkenstein and Goebersdorf.

Byers, of Charlotte,⁹⁴⁶_{Nov., '92} warns travelers against the disastrous effect of too sudden a transition from the ice and snow of the north to the humid and debilitating subtropics. Invalids should leave the north early in the autumn and work their way down by gradual stages.

Littlejohn, of Thomasville, N. C.,⁵⁹_{Nov. 19, '92} writes enthusiastically of Southwestern Texas, particularly San Antonio, as a winter resort for those suffering from catarrhal affections, nephritis, and rheumatism. The climate is dry and mild, the thermometer seldom going below the freezing-point. The prevailing winds blow from the south.

Pueblo²⁸¹_{Aug.} is highly praised by Stoddard for consumption and allied diseases. It is 4480 feet above the level of the sea. The surrounding soil is sand and adobe, and so dry that nothing but the cactus and sage-bush will grow without irrigation. The prevailing wind is from the west and southwest. The number of hours of sunshine in the year is probably greater than in any other American city.

In the discussion which followed this paper de Witt mentioned some of the unfavorable features of Pueblo,—namely, the drinking-water (impregnated with alkaline salts) and the great velocity of the winds.

An interesting paper by Webster, of Oakland, Cal.,¹⁹²_{June} calls attention to the fact that, while a climate may be beneficial to one condition, it may be injurious to another. He claims that there is a stimulating element about the climate of California which aggravates nervous disorders. He regards it as exceedingly dangerous

to those who are hereditarily predisposed to insanity. Religious crazes and acute manias are becoming quite common.

Williams, of London, ²_{Mar.25} mentions, among other dry, warm climates, that of the various stations of Southern California, namely, Los Angeles, Pasadena, Sierra Madre, Santa Monica, Santa Barbara, and San Diego. The climate of Southern California depends on three factors,—viz., its southern latitude, its protection by various mountain-ranges against cold north and east winds, and the influence of the Pacific Ocean, and especially of the Japanese current, which washes the shore of the State. The temperature of the Pacific off this shore varies in winter from 60° to 70° F. (15.6° to 21.1° C.). One great drawback, however, to Southern California is the mist which rolls in from the ocean and gives a rawness to the air.

Karkeek, of Torquay, Devon, Eng., ¹³¹_{June} highly recommends that resort for beauty of surroundings and for healthfulness. Ruskin has called it the "Italy of England." It is not especially recommended for any one form of disease, but more as a general health resort. Ilfracombe, another health resort of Devonshire of much the same character, is described by Gubb, ²²_{Jan.18} Macklin, of the Scilly Islands, ⁶_{Apr.} writes of the mildness and equability of those islands, of the abundance of sunshine, moderate rain-fall, pure air, and absence of prolonged high winds. The soil is porous and easily drained. After a heavy rain the moisture has so drained off that the most delicate may walk abroad. These islands have the warmest temperature in England, taking the year round. Felixstowe Spa and the adjacent watering-places of Aldeburgh and Lowestoft are beautifully situated in the county of Suffolk, England, facing the German Ocean at the mouth of the Deben River. Jones ⁶_{Nov.12,'92} considers it a typical place for children, with its fine bathing facilities. Patients suffering from nervousness, weak circulation, or acute eczema are warned by Tidey, of London, ⁶_{June 10} against the dry, stimulating air of Montreux. On the other hand, he highly recommends it for phthisis, especially in the young; for chronic pneumonia and bronchitis, and catarrhal affections.

According to Williams, of Shadwell, ²_{June 3} the Oertel cure is scientifically carried out at Gessensass, a station in the Austrian Tyrol at a height of 7340 feet. In the immediate neighborhood are well-made foot-paths, selected and marked out by Oertel in

quarter-hour distances, which range from a level path along the river to the ascension of the Huhnerspiel, a climb of 5500 feet. Wendt, of New York, ⁵⁹_{July 22} is convinced that for certain morbid conditions a course at Franzensbad, Bohemia, is more beneficial than the indiscriminate drinking of waters at Carlsbad. Franzensbad is situated in a fertile plateau, a short distance from Egan, where the air is bracing and refreshing.

Madden, of Dublin, has contributed various articles ²²_{Jan. 25} ²⁶_{May, Aug.} on the health resorts of the Riviera and Southern France. Vichy he describes as one of the most accessible of Continental watering-places for the English invalid, for whom abundant accommodations are afforded in the countless hotels and splendid thermal establishments. The environs have been described as flat and uninteresting; but this description applies to the immediate vicinity of Vichy only, for the surrounding country affords some of the most beautiful scenery in France. The climate of Hyères is warmer and more equable in winter than that of Nice. It is also drier, the number of rainy days being only forty annually, while Nice has sixty. During the winter the prevailing winds are from the north, east, or south-southeast, while in the spring they are from the east, southeast, or northeast. The rain falls mostly at night; so that there is rarely a day when the invalid may not go out. The mistral is very seldom felt here, and snow is hardly ever seen. Generally speaking, the climate may be said to suit children, as well as patients of a scrofulous diathesis predisposed to consumption. It is beneficial in cases of chronic rheumatism, gout, chronic bronchitis, atonic dyspepsia, and some other troubles, for which the climate of Nice would be found unduly tonic or stimulating. Cannes is a still more important health resort. To the south it is open to the Mediterranean, while on the north and west it is sheltered by the Maritime Alps. The mean annual temperature is 60° F. (15.6° C.). The average winter temperature for fourteen years was 50° F. (10° C.): spring, 62° F. (16.7° C.); summer, 71° F. (21.7° C.); autumn, 55° F. (12.8° C.). January is the coldest month. The prevailing wind is from the east and south-east. Violent winds and the mistral are said to be felt even less at Cannes than at Hyères. The annual number of rainy days is fifty-two. Cannes is recommended for cases of phthisis in lymphatic and scrofulous persons, and should be avoided by those suffering

from febrile phthisis and those having a tendency to hæmorrhage. It should also be avoided by those who are prone to attacks of acute gout or eczema. In other respects, much the same diseases which derive benefit at Hyères can be sent to Cannes. Nice is situated on the verge of a valley, surrounded on three sides by the Maritime Alps, and open on the other, or south, side to the Mediterranean. The climate is warm, dry, tonic, and exciting. The average mean temperature is a little higher than at Cannes. Rain falls, on an average, on sixty days, and sixty-six days are cloudy in the year. The northerly winds from the snow-covered Alps are attended by cold, dry weather and prevail mostly in the spring, at which season, conjointly with the east and west winds, they blow with great violence along the Valley of the Paillon and through those parts of the town that border the river. The southerly winds in the summer are accompanied by heavy rains. The mistral is shut out to some extent by the mountains; still a dry, irritating wind from the northwest is occasionally felt. A former physician of Nice states that it is a great mistake to assert that Nice, on account of its climate, agrees with phthisical patients. A residence there will often prove beneficial to children of weak constitution, to incipient phthisis, chronic bronchitis, and chronic rheumatism, especially in those of a scrofulous habit.

Mentone has a warm, equable climate, and is exempt from harsh, cold winds, especially the mistral. It is not adapted, however, for a permanent residence, as it is found to exert a very enervating influence on those who spend the entire year there. San Remo has, in some respects, a climate superior to that of Mentone, and is also less crowded by visitors. In fact, the entire Riviera, from Nice to Spezia, is studded with small towns, such as Bordighera, Savona, Voltria, and Nervi, which have as many natural advantages as the more-famous ones.

Williams, of London,²_{Mar. 25} attributes the warm winters of the Riviera to its southern latitude, its protection from cold winds by the Maritime Alps, and the warming and equalizing influence of the Mediterranean. On account of the exciting qualities of its climate, the Riviera is contra-indicated for nervous affections, especially insomnia and hysteria.

An ozone establishment is described by Vignal, of Paris.²_{Dec. 24, '92} It contains inhalation-rooms, where the ozone can be inhaled

directly through tubes or diffused through the atmosphere. A list of ten cases is given, with observations on the effect of ozone on red blood-corpuscles and hæmoglobin. The results were highly satisfactory.

A quiet retreat in Northern Italy is the tranquil valley of Blenio, not far distant from the St. Gothard Railway. ²²_{Sept.20} It contains an hydiatic establishment at Acquarossa, an ideal place for the overworked to pass a few weeks in July or August. Soffiagini, the Professor of Dermatology at the University of Pavia, directs here the treatment of eczema and psoriasis.

Brunton, of Galashiels, ⁵⁹_{Aug.16} gives a very attractive description of that charming and salubrious spot, Sorrento. Its high situation, its sheltered location, the porous nature of its soil, and its temperature entitle it to a place among the health resorts of Southern Italy. The average temperature for the first three months of this year was 51°, 54°, and 56.3° F. (10.6°, 12.2°, and 13.5° C.), respectively. The dryness of the place makes it beneficial for bronchitis, winter cough, and rheumatism.

The late Surgeon-Major Parke ²⁰⁸⁴_{Mar.4}; ⁶_{July 1} gives much interesting information as to the climate of Africa. While the climate of the extreme north and south, the Mediterranean and Cape Colony zones, is universally allowed to be healthy, many objectionable features are to be found in the climate of the intermediate portion, which includes the bulk of the continent. The temperature of the equatorial zone of Africa is decidedly moderate, on account of the highlands of the interior. The great enemy of Central African life is fever. "As we crossed the equatorial belt of Africa, everybody who got a wetting, and was exposed to a chilly breeze afterward, developed fever as a natural consequence. Beasts as well as men suffered." The author's experience is decidedly favorable to the prophylactic use of quinine.

Orotava, on the island of Teneriffe, is fully and interestingly described by Vignal, of Paris. ²_{Mar.4} The climate is equable, and not so hot as would be expected from its location, on account of local meteorological causes. That painful sensation of sudden chill which one feels along the Riviera, especially at the hottest places, such as Mentone, is not experienced. The rain-fall takes place mostly at night.

BALNEOLOGY.

Various attempts have been made to explain the therapeutic effect of mineral waters used externally, the general belief being that it is due to other than the chemical principles contained in the water. Allot, of Nérís, ¹⁰⁸⁸_{July 2} in an interesting historical review, states that electricity was formerly supposed to be the factor, though no scientific reason for this theory was given. The observations of the author lead him to the same conclusion; but, in order to obtain the benefit of this electricity, the water must be used at its source, as, if it be exposed to the air for any length of time, or kept in bottles, it loses this subtle agent.

J. Makawejew, of Staraja-Russa, ¹³_{July 15} does not consider it necessary to omit medical baths during menstruation. He bases his conclusions on one hundred and forty-nine cases with and without uterine disorders, in which the effect was negative on those with healthy generative organs, and beneficial when a pathological condition was present.

The matter of sea-baths for children is brought to our attention in a timely article ⁸⁷⁹_{Aug.} by Jules Simon. Sea-water contains 29 grammes (7¼ drachms) of NaCl to the litre (quart), besides certain quantities of bromine and iodine, and has a temperature varying from 15° to 20° C. (59° to 68° F.). This temperature puts it in the class of cold baths, although sea-water may be used warm, and the ordinary effects of a cold bath are observed after its use. These baths should never be given to a child under 2 years of age, for infants, as a general thing, react as poorly as elderly people.

They are contra-indicated in nervous children of exquisite sensibility, especially light sleepers; and, if persisted in, they may cause convulsions or even meningitis. Epileptics and choreic and hysterical children all do badly in sea-water; and even residence on the sea-shore seems to injure those affected with cerebral paralyses and scleroses. Rachitic children, on the other hand, do remarkably well at the sea-shore, as do, also, those convalescing from all acute diseases except scarlet fever, measles, and diphtheria. The child should wait five or six days before commencing the baths, in order to become somewhat accustomed to the change. The first bath should not last longer than a few seconds, and the second bath should not be given until the third day. Even when

accustomed to it, the baths should not last longer than six minutes each; and at the end of three weeks they should be entirely omitted for several days.

Herman Keller, of Rheinfelden,⁴¹_{June 26} has been engaged for several years in determining the effect of concentrated (12 to 25 per cent.) brine-baths, and he has observed only good effects to follow their use in various affections. The excitement often observed in weaker (2 to 4 per cent.) baths he has never seen, and he even considers that the concentrated solutions have a quieting effect on the nervous system. A defective excretion of nitrogenous principles is the especial indication for their use.

Deichmüller⁴¹_{Apr. 27} speaks highly of mud-baths, and claims that they are growing in favor. He reports great success in their use for resorptive purposes, and among his cures cites cases of appendicitis, as well as of gouty and rheumatic affections. The temperature of these baths is increased until the patient can bear them no hotter. Sand-baths were formerly used by the Arabs in rheumatism, and to-day in Bohemia they are highly prized in the treatment of gout. Kornel Preisz¹⁰⁸²_{May 15} describes their use, and says that wet sand at a temperature of 40° C. (104° F.) causes no perspiration, but even refreshes the patient, while it causes profuse diaphoresis if it be dry. Sand is used exactly as water is,—that is, full baths, half baths, local applications, etc., are given. In Blasevitz and Köstritz such methods are employed systematically. The special work done at Larvik, in Norway, is referred to by Holm.⁸⁷⁹_{Sept.} The Larvik bath depends for its efficacy on a combination of thermal, mechanical, and chemical applications, and comprises sea-baths, hot-air-baths, and mud-baths, with massage. Arthritic affections, especially those of rheumatic origin, are best treated here.

Abel, of Odessa,⁴¹_{June 25} describes the “limanen” or salt lakes, which are found near Odessa. They are small bodies of water, and are either entirely separated from the Black Sea or are connected with it at the time of the spring inundations only. The water possesses all the characteristics of sea-water, except that it is much more concentrated and contains eleven times as much iodine and considerably more bromine than sea-water. By its use the rapidity of the pulse and respiration, as well as the circulatory tension, is increased; while the amount of nitrogenous principles excreted in the urine is not only increased, but this increase persists

for several days. Mud-baths are also used here. This mud, or "schlamm," is of the consistency and appearance of shoe-blackening, and has an odor of H_2S . Chronic rheumatism, scrofulous diseases of the peripheral nerves, chronic exudative processes, and tertiary syphilis are all improved by a course here; while tubercular affections and acute inflammatory processes do badly. Elderly persons also obtain no benefit.

At Sandefjord⁹⁹⁶_{June 10} the "artificial bath of Nauheim" is employed, which consists of sea-water impregnated with CO_2 . Various forms of cardiac disease are treated, the effect being similar to, but more lasting than, digitalis. Weinberger⁵⁷_{Apr. 9} claims that the baths at Pistyan are a specific against sciatica. He has found one course of treatment sufficient for the most inveterate cases; and one case in particular is cited where the pain had resisted every other form of treatment for ten years, and yet one season at Pistyan cured it permanently. The method of treating affections of the respiratory passages at Luchon by inhalation is well described by le Juge²⁴_{July 23}. The waters have a temperature of $48^\circ C.$ ($118^\circ F.$) and contain sulphurous-acid gas. The method of inhaling the hot gas is such that each inhaling-tube has its own reservoir of water; so that there is no chance of infection by inhaling another's breath. Each tube has also an attachment by which the quantity of gas to be inhaled, as well as its temperature, can be controlled. This renders the system a scientific one, and avoids the danger of injudicious inhalations. The water may also be used externally and internally. Three cases of cured tuberculosis of from four to six years' standing are reported. Luiz Lopèz¹⁵³_{June 1} shows that Portugal is well supplied with springs of all kinds. A list of 390 is given, of which 340 are found in Portugal itself, and 50 in its dependencies; 54 springs situated in seventeen localities are of sufficient importance to have been made bathing stations, while the remaining 300 have not yet been properly analyzed and tested.

The springs at Arima, in Japan,⁹⁹⁶_{Sept. 10} are said to resemble closely the Carlsbad waters. They are used externally and are efficacious in chronic rheumatism, in tubercular and strumous-joint affections, as well as in inflammations of the mucous surfaces. The springs at Atami, also in Japan, are of the geyser form, and are peculiar in that they spout to a height of fifty feet once in three hours daily, except every ten days, when the water flows continuously for twelve

hours and ceases for twelve hours. They are employed in gastric and rheumatic affections, scrofula, and conjunctivitis. NaCl is the principal ingredient in both waters.

A very extensive series of articles ^{459,19,21,23}₉₂; 5,6,7,9,10 has recently been devoted to Santa Fé, on the Island of Pinos, by Ranz de la Rubia. He claims that it is an admirable all-the-year-round resort, and gives meteorological tables to prove his assertions. Analyses of the different waters are given, accompanied by the method of analysis. Maladies of assimilation, skin affections, dyscrasiæ, and lung affections all seem to be successfully treated by a course at these springs, and cases of each are cited at length. These articles give one a good idea of what can be done at a Cuban resort by conscientious work. Balbino Quesada ⁶³⁴_{June 16} speaks highly of the external use of lime-sulphur water in the treatment of various skin affections, especially those of parasitic origin. P. Siedler ⁸⁴⁴_{Aug. 27} has made observations on fifteen different natural mineral-spring waters and finds bacteria in all. In one bottle of Karlsbad Mühlbrunnen he found over twenty-eight thousand in a cubic centimetre; and he is of the opinion that no bottled mineral water is free from such organisms. Still, as he well says, it is the variety and not the number of bacteria which is of importance. Artificial waters also contain bacteria, but these can be avoided by careful sterilization of all materials used in production. Paul Rodet ⁹⁰⁶_{Aug. 10} has found, in sulphur waters, organisms which he has named "sulphur bacteria," whose rôle is that of oxidizing agents solely. Natural ferruginous waters, where the iron occurs as a protoxide, contain bacteria, among which is found the *Leptothrix ochracea*. These bacteria are surrounded by a gelatinous envelope containing sesquioxide of iron. All the other mineral waters which he examined contained only common bacteria.

C. Reihl has carried out some investigations in Vienna ²²_{July 5} for the purpose of estimating the influence of mineral waters containing iron and arsenic upon the blood of anæmic individuals. He employed the Levico water in doses varying from $\frac{1}{2}$ to $3\frac{1}{2}$ ounces (16 to 109 grammes) daily, and a few of his cases are reported. He found that the hæmoglobin contents of the blood-corpuscles increased, in some cases, from 28 up to 95 per cent. in five weeks. He claims that under the systematic use of an arsenic-ferric water like Levico the production of red blood-corpuscles is greatly in

advance of that brought about by good nutrition alone; and this improvement can be effected even if the patients continue to live under the same conditions as those in which the morbid state was acquired.

Ph. Bernard⁵⁵_{Apr. 8} prefers to treat anæmia and chlorosis with waters containing *small* quantities of iron. By this means he obtains better and quicker results than when he employs the pharmaceutical preparations, and, at the same time, he avoids all the unfavorable symptoms so often produced by them. He advises the "St. Alban" water for such purposes because its carbonate of iron is not neutralized by the presence of a quantity of other alkalies, and because it is kept in solution by the large amount of CO₂ contained in it. He says that just as good results may be obtained at home by the use of properly-bottled water.

Glax, of Abbazia,¹⁶⁹_{Dec., '92} speaks in high terms of the Victor Spring, in Königswart, Bohemia, quite near Marienbad. It contains from 3 to 4 centigrammes ($\frac{1}{2}$ to $\frac{2}{3}$ grain) more of carbonate of iron to the litre (quart) than the renowned springs at Schwalbach, Franzensbad, and Pyrmont, and not much less CO₂. It has not yet been brought into such prominence as it deserves; but the improvements and modern appliances which are now being introduced will soon make it well known.

The waters at Renlaigne, Puy-de-Dôme,¹⁵²_{Feb. 16} are ranked amongst the best known in Auvergne, and are classed as sparkling, alkaline, ferruginous. They have a mean temperature of 13 $\frac{1}{2}$ ° C. (56.3° F.). Unlike many other springs, their constituents are not only small in amount, but quite constant.

The water from the springs at Sanson, near Neubourg,²⁰³_{Aug. 1} contains, according to Pouchin, more oxygen than any other known water, as well as very small quantities of mineral constituents. It has been employed with great success in diabetes, and some cases have been reported in which the sugar has entirely disappeared under its use. Good results are also claimed for it in tubercular affections.

The treatment of consumptives at bathing resorts is considered by Kolba, of Reinerz,⁴¹_{May 11} who advises that such patients be sent to baths containing either the chloride or sulphate of soda, iron, or the alkaline carbonates. He claims that the CO₂ and HCl act as disinfecting agents on the contents of the digestive tract, while

the alkalies neutralize the increased acidity. The entire process of digestion is assisted, and there follows, as a natural result, increased alimentation and a better condition of the blood. He draws especial attention to Soden, Lippspring, Salzbrunn, and Reinerz.

Aix-les-Bains ²⁹⁰_{Aug. 22} no longer holds its former rank among the well-known baths of Europe. Its waters are not less efficacious than they formerly were; but the management shows so little enterprise in making visitors comfortable that people are being driven away. The accommodations at the baths themselves are antiquated and incomplete; while the town is dirty and the streets dusty and unswept. Even the hotels are behind the times, and very little attempt is made to attract guests.

In this connection it is interesting to note that, after a prolonged discussion, the German Balneological Society voted that it recognized the necessity of all baths and hydropathic institutions being conducted on true hygienic principles, pledging itself to do its utmost to have such regulations made compulsory by law.

Deichmüller ¹⁰⁸²_{Mar. 15} calls attention to the reprehensible custom of sending patients afflicted with contagious or infectious diseases to bathing resorts, and especially of sending to such places children convalescing from measles, scarlet fever, or pertussis. According to Lyman, of Chicago, ¹³⁹_{Apr.} only maladies belonging to the diathetic diseases can be successfully treated by mineral waters; and under this class he recognizes only two forms, the scrofulous and the arthritic. He has found the Waukesha lithia-spring water of great benefit in these diseases. He also recommends it highly in obesity and diabetes, for constant use as a solvent of nutrient substances, and for proper re-inforcement of the fluids of the body.

HYGIENE AND EPIDEMIOLOGY.

By WALTER WYMAN, A.M., M.D.,

AND

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HYGIENE.

ALIMENTATION.

Milk.—In the preceding ANNUAL reference was made to the subject of sterilization of milk, with a view to determine its effect upon the nutrient qualities of the fluid when thus treated. The subject is still of interest for many reasons. Crolas ²¹¹_{June 25} has recorded the following conclusions concerning the modifications produced by boiling upon the constituents of milk: 1. Boiling removes from the milk a small quantity of butter, held by the albumen at the moment of coagulation by heat. This quantity is found again in the skim or pellicle which forms upon the boiled milk when cooled. 2. Boiling has no action upon the casein and lactose. 3. Boiling increases the quantity of the soluble phosphates. This would seem to indicate that the boiled milk contains a larger quantity of readily assimilable phosphoric acid. From all his experiments, Crolas concludes that boiled milk is at least equal, if not, indeed, superior, as an alimentary product to unboiled milk.

Chemical Difference between Human and Cows' Milk.—F. Soxhlet ³⁴_{Jan. 24} proposes, by the addition of extra milk-sugar to diluted cows' milk, to make up for the lowered percentage of fat which the diluted milk contains. According to König, cows' milk, in relation to human milk, contains 0.24 per cent. less water, 0.09 per cent. less fat, 1.33 per cent. less milk-sugar; on the other hand, 1.26 per cent. more albuminous matter, and 0.40 per cent. more ash. If cows' milk be diluted with half its bulk of a 6-per-cent. solution of milk-sugar, the mixture contains as much albuminous matter and milk-sugar as woman's milk, but 1.32 per cent.

(F-1)

less fat. Soxhlet proposes to obviate this difficulty by substituting an extra quantity of milk-sugar, so as to bring the food-value up to the normal. This can be done by diluting cows' milk with half its bulk of a 12.3-per-cent. solution of milk-sugar.

Influence of Milk upon Infantile Mortality.—Alfred Hill makes a valuable report¹⁵_{July} upon the causes of infantile mortality in Birmingham for the year 1891. He points out “what must strike the mind as very remarkable, viz., that the improvement in the general sanitary condition of the town during the past nineteen years—which has had the effect of lowering the *general* death-rate very considerably—has had no perceptible influence on the *infantile* death-rate (*i.e.*, the proportion of deaths under 1 year of age to 1000 births). This is clearly seen from the following figures:—

Birmingham.	Infantile Death-rate.	General Death-rate.
Average of 9 years, 1873-81	169	23.5
Average of 10 years, 1882-91	169	20.6
Decrease	0	2.9

“It will be seen that, while the general death-rate was reduced by 2.9 per 1000 persons living,—a reduction equal to 12 per cent.,—the infantile death-rate showed no reduction whatever. If the infantile death-rate had decreased at the same rate as the total death-rate it would have fallen to 148, instead of remaining at 169.”

Investigation showed that the infantile death-rate in what would be considered the most unsanitary portions of the city was less than the rate of the city as a whole; and, after trying to ascribe it to lack of ventilation, sewerage, water-supply, and other unhygienic states of life, it became evident that external sanitary conditions had no well-marked influence on the rate of mortality at the particular period of life under consideration. It may be that they affect health, as no doubt they do, at this period, but that their effect on life is not exerted until a later period.

He arrives at the conclusion that the use of substitutions for mothers' milk is accountable for a large proportion of the deaths of infants, digestive diseases largely preponderating. He says: “While milk is said to have formed a considerable proportion of the substituted food, my own experience and that of others is that very little milk—often none at all—enters into its composition.”

It is stated by Finkelnburg, of Bonn, that the rate of infant

mortality in Norway is 106 and in the Faroe Islands only 86 per 1000, against 171 in Birmingham. "But in Iceland, with a similar climate, but doubtless much less care, the infantile death-rate is 295. This difference appears strange, and must evidently depend on something independent of temperature. The explanation is that, while in Norway, as I have stated, children are universally, in Iceland they are rarely, suckled."

Hill rightly argues that "privation of breast-milk and improper feeding are not only answerable for infantile sickness and death, but their effects are seen, in after-life, in imperfect development and inferior physique." The improper feeding of children is slow starvation. The social conditions of Birmingham, it being a manufacturing town, enter also into the problem. On this point he says: "One of the causes of infantile mortality is considered to be the continuance of exhausting labor by pregnant women till within too short a period, even up to the time, of confinement, and the resumption of such labor too soon afterward. In Alsace and in some Swiss cantons employment of women in factories is forbidden by law for six weeks before and six weeks after delivery, only a partial deduction, or none at all, being made from their wages. In the case of one factory adopting this system, it was found that a reduction of 13 per cent. was effected in the infant mortality. I think, then, it may be considered that social rather than sanitary agencies must be looked to for effecting the desired reduction in infantile mortality. The wards in which more mothers are employed away from home, in which more infants are insured, and in which the infantile mortality is highest, are the wards whose inhabitants are lower in the social scale, and it seems to me that the figures point to the social position as the most constant factor in the causation of infant mortality."

Cows' Milk and Tuberculosis in Japan.—Anent the series of articles by E. F. Brush,¹_{90, 90} upon the geographical distribution of tuberculosis and dairy cattle and the relation of bovine and human tuberculosis, another contribution on this important topic during the current year is from the pen of Albert S. Ashmead,²⁰⁰_{Apr. 22} who describes the results in Japan of the absence of dairy cattle. He says: "The Japanese mothers are compelled by stress of circumstances to suckle their babes themselves; and these delicate dwarfs have become the most perfect, the most successful *Almæ Maters*

of the world. Artificial lactation is altogether unknown. The children are suckled until the sixth year, and you may hear them ask for the breast in a language as correct as that of adults. The great reward which Japan reaps from this meritorious care of motherhood and childhood is the absence of rachitism. All observers have referred to the fact, and to the absence of rachitic pelves, which is the consequence of it; hardly any difficult confinement, and a very small percentage of deaths in childbirth."

To this he attributes the absence of cows' milk. According to Brush, however, this should also result in an absence of tuberculosis, while, as a fact, the Japanese are not entirely exempt, the disease being particularly prevalent among the upper classes and nobility, while the lower classes are generally immune. The explanation offered by Ashmead is the custom of close intermarriage, within degrees forbidden among us, practiced by the aristocratic classes, which has resulted in degeneration of the physical types. He also suggests that, as the habit of kissing is unknown in Japan,—practically forbidden,—this means of propagation of tuberculosis is inoperative there.

Milk-Supply of Cities.—In an editorial on this subject, ¹_{Aug. 6} attention is called to its supreme importance to the health of large cities, as it is the exclusive food of thousands of invalids and young children, and an important element in the diet of adults. The writer properly claims that the safety of the supply must not be left to sterilizing and Pasteurizing when received from the dealers; but that the chief attention of the health authorities should be devoted to the management of the supply at its source. He refers to the fact that "in Boston, under the supervision of Dr. Rotch, milk produced at farms under close medical supervision can be obtained. He has established the most complete and perfect laboratory in the world. Physicians, by simply writing a prescription stating the percentage of fat, casein, and sugar desired for any special case, can have it delivered daily in the form of absolutely pure, clean milk, the exact proportions of the various constituents having been determined with mathematical exactness."

Attention is also called to a nearly perfect plan for procuring cows' milk designed for clinical purposes which has been carried into practical operation and "recently perfected by Dr. Henry L. Coit, of Newark, New Jersey. In describing this plan he refers

to the folly of relying upon legal enactments, or even public opinion, to secure clean milk. It can only be obtained from dairies under the supervision of medical men. His plan includes several general requirements, each of which is very essential. It is, first, important that physicians should give their practical support to the movement, which must be conducted by a commission of physicians acting without pay and having no financial interest in the business, who shall endeavor to bring to the city a supply of milk produced under such regulations that purity will be assured. It is also necessary that dairymen possessing honor, financial ability, and dairy facilities should be induced to conduct their dairies in conformity with a code of requirements made by this medical commission and imposed by it in legal form."

In Massachusetts ⁹⁹_{Aug. 2} convictions have been obtained this year against dealers who mixed preservatives (borax, boracic acid) in milk in hot weather. The Supreme Court also held that cream was subject to the operation of the milk laws. Of the process of establishing the diagnosis, he gives the following description: "The elevation of temperature that follows the injection of tuberculin in a tuberculous animal comes on in from nine to sixteen hours, and reaches a point from one to six degrees above the normal. In some cases the temperature drops back to normal within a few hours, but in others the fever remains for several days. The second injection is always followed by a milder reaction than the first, even if a period of several days or a month intervenes. It was found that the degree of reaction was not in proportion to the extent of the lesions, for animals in which the lesions were slight sometimes displayed marked reactions, while the reaction in animals with wide-spread tuberculosis was sometimes slight. We may thus say that tuberculin furnishes a poor index to the severity of a case of tuberculosis; by its use we can simply determine the presence of the disease. For this reason tuberculin does not entirely supplant physical examination in the diagnosis of tuberculosis of cattle, but both methods should be used together, and of the two the former is by far the more valuable and important. It is safe to say that by the most careful physical examination not 25 per cent. of the cases of tuberculosis among cattle can be detected, while by the use of tuberculin and physical examination together all of them can be discovered."

Disease Germs in Boiled Milk.—Fayer²_{p.321} states that he does not believe that the germs are destroyed by boiling milk. The tubercle bacillus is killed only at a temperature of 110° to 115° C. (230° to 239° F.). Experiments made at his laboratory at the Physiological Institute show that the degree of ebullition never exceeds 100° C. (212° F.). Children, he says, die from enteritis, and boiled milk, it is to be feared, might encourage this affection. He considers it hurtful to children. The experiments of Ponchet and Bastian also established this fact. The failure to destroy micro-organisms in milk may be due to the presence of solid particles, which afford them protection in the boiling fluid.

Bovine Tuberculosis.—According to Ostertag⁹⁹_{Mar.23} the ratio of tuberculous meat found in nine German cities where meat is officially inspected in recent years was 19.3 per cent. of the total number of cattle.

In Germany it is not customary to condemn as unfit for food the flesh of animals which have suffered only from localized tuberculosis. The order of the Prussian Minister of Agriculture, dated March, 1892, prescribes that "the meat of tuberculous cattle is, as a rule, to be considered injurious to health when the meat contains tubercular nodules, or if the animal is emaciated, even if no nodules are found in the flesh. The meat of tuberculous animals is to be held to be fit for food if the animal is in good condition; and if (1) the nodules are found exclusively in one organ, or (2) if two or more organs are diseased, these organs are in the same cavity of the body or connected directly with each other, or by lymph-vessels, or by blood-vessels which do not belong to the general circulation, but to the lungs or portal venous circulation."

At the International Veterinary Congress in Paris in 1889 the following stringent resolution was adopted: "Meat from tuberculous animals, mammals, and birds should be eliminated from the food of man and animals, whatever the degree of tuberculosis, and whatever the apparent quality of the meat."

Shirley Murphy, the eminent medical officer of health of London, in commenting upon this resolution, says of it: "The views of this Congress are not those which generally prevail; and although they are to be commended for their thoroughness, it does not appear that the evidence which at present exists renders it necessary to enforce them without reservations."

No reliable statistics on the subject of tuberculosis were available in England till the slaughter of cattle suffering with pleuropneumonia gave opportunity to determine how many of that class were also affected with tuberculosis. The results were as follow :

Of the total cattle slaughtered, 12.22 per cent. were tuberculous.	
Of cows and heifers in milk, or with calf	16.09 per cent.
Of bulls	1.53 “
Of other cattle over 1 year old	2.77 “
Of other cattle under 1 year old	1.2 “
In Midlothian, of cows	22.5 “
In London and the surrounding districts, of cows	15.5 “

Leonard Pearson,⁹_{Dec.10,'92} of the Veterinary Department of the University of Pennsylvania, in an article on “The Diagnosis of Bovine Tuberculosis,” points out anew the value of tuberculin as an agent in determining the presence of the disease in cattle. He says: “It is well known that the tuberculosis of cattle is contagious, and sometimes spreads rapidly, until an entire herd is diseased, and that the only way to check the progress of the disease is to destroy or remove all affected animals, enforce good hygiene, and thoroughly disinfect the stable. Heretofore it has been impossible to carry out the first of these measures, on account of the great difficulty in diagnosticating bovine tuberculosis in its early stages, and most of the attempts at eradication have been failures, or have occupied a number of years.

“It is easy, then, to appreciate the great value of tuberculin to the veterinarian, and the good results that have followed its use in this country are exceedingly gratifying.”

Butter.—In the general hunt for micro-organisms in food, butter is the latest to be investigated. We are informed by a recent investigator⁶_{Jan.23} that there were contained in 1 gramme (15 grains) of butter (as much as would go on the point of a knife) 2,465,555 micro-organisms from the centre of the pat, and as many as 47,250,000 on the outside. In fact, in some cases it is tolerably certain, it is stated, that the number of organisms swallowed with a moderately large piece of bread and butter may exceed that of the whole population of Europe. Butter kept in a refrigerator showed a marked reduction in the number of bacteria,—a result which is also obtained by the addition of common salt. Samples of artificial butter, curiously enough, were invariably found to be much poorer in bacteria than ordinary butter; thus, while the

smallest number found in 1 gramme was 747,059, in real butter the minimum was considerably over 2,000,000 microbes. Two varieties of bacilli have been isolated and described; and inasmuch as they were found to be constantly present in butter, they were probably specific micro-organisms of a non-pathogenic character. Nature has probably fortified man against many bacteriological dangers by the antiseptics of digestion. There is the possibility of magnifying the importance of bacteria in the public mind, and reaching the *reductio ad absurdum* in dealing with it. The Health Council of the Seine recently instructed a member of the Paris Medical Academy to ascertain whether the butchers of the slaughter-houses sterilized their instruments. He reported, with much common sense, as it seems to us, that "not only would it be necessary to sterilize all the knives, saws, choppers, etc., but also boards, scales, troughs, pails, baskets, carts, linen for wrapping the meat,—in fact, all the thousand and one articles used."

The adulteration of butter with margarine is said to be easily recognized ²²_{Aug.9} by the following process: A little of the suspected butter is spread between two plates of glass, and examined microscopically by the aid of a lamp, the rays of which are polarized by passing through plaster of Paris. If the butter is pure, nothing is noticeable; but if even only a small amount of margarine is present, small stars (crystals of stearine), recognizable by the prismatic colors of the rainbow, are seen.

Tinned (Canned) Foods.—Six cases of tin poisoning, with one death, are reported by W. A. Campbell, of Colorado Springs, ⁸⁰_{Mar.16} the result of the ingestion of domestic-canned tomatoes sealed with wax in used peach-cans. Four of the cases disclosed in the stools specimens of *Ascaris lumbricoides* and *Oxyuris vermicularis*. His conclusions upon this subject are thus summarized: 1. Stannous salts are poisonous to the human system, being similar in their action to the other mineral poisons,—lead, zinc, arsenic, antimony, etc. 2. The salts of tin are anthelmintic as well as the powdered product. 3. Toxic doses of the salts produce symptoms similar to those from ptomaines. 4. Canned food-products may contain stannous salts in poisonous quantities. 5. The danger from this source is increased from exposure to the air; hence, all fruits should be emptied from tin cans as soon as opened.

Edmund Gwynn, Medical Officer of Health, Hampstead, ²_{Dec.3,'92}

reports a case of acute poisoning in two persons from canned ox-tongue. The point of interest in this case is the minute quantity of infective matter which caused the sickness, as the person who opened the can noticed that the odor from it was unusual and merely inserted a fork in it to test it. This fork was later used to cut an omelet and the infection must have come from that source. Allied closely with this is ptomaine poisoning from similar sources. It is clear that the process of canning is not responsible for all cases of poison from the ingestion of the contents of the tins. A case in point is reported by Thomas Stevenson, ⁶_{Dec. 3, '92} in which death resulted from eating sardines. It appeared that one person besides the victim had partaken without any unpleasant results, and examination by the official analyst showed the tin of the can to be bright and uncorroded. He found no stannous salts upon chemical analysis. The cause of death could not be attributed to metallic poison, but lay in the fish, of which it was found that some, not all, were infected by a toxic ptomaine. He concluded that it was generated in the fish before sealing. The subject of ptomaine poisoning is extremely intricate, and we have as yet no defined laws relating to the number, nature, and properties of these toxic bodies. The researches of Brieger, Gautier, Fraenkel, and others have given some proximate knowledge of their differentiation, but their alkaloidal character is still in dispute.

Public Slaughter-Houses.—The whole process of preparing meat for human food, from the grazing ground to the dressing of the carcass, is a matter of vital interest to the general public. Sir B. W. Richardson ²⁰⁴²_{May} deals with this question in an able article and advises the construction of abattoirs in all towns of considerable size, both from an economical and sanitary point of view. The injury to the quality of meat from cattle subjected to long journeys by rail is well understood, and the shrinkage in quantity becomes a matter of serious import to the dealer and the public. In an able work by Daniel Tallerman ²⁰⁴³ it is stated that a beast traveling quietly on an ordinary road will lose one stone per day, and that an animal will lose 5 per cent. in weight in the single railway journey from Aberdeen to London. "Taking the 700,000 animals annually exported from Ireland to our markets, and estimating only on the 5 per cent. loss just referred to, we find an absolute shrinkage of over 25,000 tons of available food in the Irish cattle-

trade alone." In America this has a more-pointed application. The long distances of travel to be undertaken by the cattle materially lessens the financial and edible value of the beasts, at the end of the journey, to the large slaughtering centres.

WATER.

Spontaneous Pollution.—At a meeting of the Society of Medical Officers of Health (England), Garrett read a paper ^{Jan. 7} on the subject of the "Spontaneous Pollution of Water, Originally Pure, in Storage Reservoirs." Taking the water-supply of Cheltenham as his text, he showed that it was drawn from the river Chelt and from springs in the oolite of the Cotswold Hills and stored in reservoirs two hundred feet above the town. This water was moderately hard,—12° to 16°,—but of extraordinary purity, yielding only 0.04 per million of albuminoid ammonia and absorbing no more oxygen than ordinary distilled water. One of the reservoirs was covered, the other two were open. Complaints having been made that the town-water had a "fishy" taste, suspicion fell at first on the Chelt, but it was soon ascertained that the fault lay with the open reservoirs on Hewlet's Hill, and that the cause was the growth of chara, which was not found in the covered one, since, forming chlorophyll, it needed light. Garrett exhibited specimens, both dried and fresh, describing it as a plant incrustated with lime-salts imbedded in a semi-gelatinous matrix. It grew luxuriantly in the early summer, but in autumn it broke up to a great extent, rendering the water turbid with its disintegrated and decomposing tissues, swarming with organisms of every kind, from protococci and desmids up to anguillulæ and entomostraca, and emitted odors variously described as fishy, sulphurous, and fæcal. The chara, as might be expected from its calcareous crust, softened the water remarkably, reducing also the nitrates, etc., during its active growth, but adding to the organic matter in its decay. Unlike peaty water containing vegetable matter, this was slightly alkaline. Attempts to exterminate the plant had been unsuccessful, and Garrett had advised the use of the covered reservoir only.

Pollution of Ice.—This subject continues to receive the attention of sanitarians and public-health officials. The supply of ice for Paris has for some time had the attention of the *Conseil d'Hygiène et de Salubrité de la Seine*. The ice from the Chaville and

Brèche ponds, as shown by the report of Riche to the Conseil, was particularly dangerous. The same may be said of the ice taken from the lakes of the Bois de Boulogne and Vincennes, and from researches at the municipal laboratory the Daumesnil lake showed the presence of a considerable quantity of organic matter. Benjamin Lee, Secretary of the State Board of Health of Pennsylvania, reported, in a discussion on water-supply, ⁷⁸⁷_{Mar.} that the ice harvested on the Schuylkill and Lehigh rivers for the large cities of the State is from polluted sources and could not be used with safety. If employed for domestic purposes, it should be used only for refrigerating in air-tight compartments and not be put into any beverage.

Self-purification of Rivers.—In an editorial on this subject, ⁹⁰_{Mar.16} the Merrimack River, in its relation to the water-supply of Lowell, Lawrence, and Newburyport and their epidemics of typhoid fever, is cited as evidence of the unsoundness of the theory that the bacteria of running streams disappear gradually in the course of the stream to its mouth. The epidemics of typhoid at Lowell and Lawrence in 1891 are remembered as being caused by the admission of excreta from towns higher up the stream, where the disease existed. Notwithstanding this warning, the town of Newburyport,—at the mouth of the river, seventeen miles below Lawrence and twenty-six below Lowell,—has suffered from the same cause this year. For the past ten years, or since the introduction of a public water-supply, this city has been comparatively exempt from typhoid fever (its death-rate from this cause being but little more than 2 per 10,000 annually). In consequence of a scarcity of water, the Water Company began pumping a portion of its water from the river and distributing it to the inhabitants, after having been warned in November against the danger of such a course by the State Board of Health. In January, 1893, the cases of typhoid fever, following closely after a similar prevalence in Lowell, suddenly rose from an average of less than 1 per month to 34 in January, with 4 deaths.

AIR.

The Weather Services and Sanitary Science.—Mark W. Harrington, Chief of the Weather Bureau, Washington, D.C., read a paper on “The Relations of the Official Weather Services to Sanitary Science,” at the meeting of the American Public Health

Association, held in the City of Mexico, December, 1892. He advances the proposition²⁵¹_{July} that the meteorological work of the various signal-service bureaus of the world may be of importance to the profession in three different ways: 1. In the reduction of their observations to systematic climatology, thus giving the broad features of the climate of the different parts of the earth. With this can be studied the relations of man to climate in a general sense, such as the relations of climate to race, to the different forms of industry, and to general diseases. 2. In giving the climate of health resorts, the data of general climatology are not sufficiently detailed for this. The ordinary meteorological observations need to be reduced and combined on a special plan (and one not always followed by meteorologists), before they can give the information which a physician needs in order to decide whether or not he may send his patient to a given health resort. Moreover, the physician needs some data, which are not, by meteorologists at least, considered properly and purely meteorological. These will be referred to later. 3. In giving the data of weather to enable the physician to correlate any special pathological phenomenon, as the fluctuations of a disease or the appearance of an epidemic (as, say, yellow fever), with the elements of weather which preceded or accompanied.

He goes on to say that the present method of computations and records is not suitable for the physician; for example, the pressure given by meteorologists is that reduced to sea-level, while that desired by the physician is the actual or unreduced. The humidities usually given in meteorological tables are the means of relative humidities, which are not only uninformative as means, but are also uninformative to the physician as a meteorological element, as they are compound, depending on both temperature and the vapor contents of the air. The moisture really appears to be of high sanitary importance. It is certainly of great weight in causing subjective feelings of comfort and discomfort, but it is comparatively neglected in climatological studies.

He stated that ozone observations can easily be taken, but that this would open up the whole question of the purity of the atmosphere to make the observations of practical value. To properly estimate this is beyond the present capacity of the observing stations, and would require careful laboratory and microscopi-

cal work. He makes the following suggestions relative to the collection of meteorological data for the use of sanitarians: 1. Atmospheric pressure, unreduced for altitudes. 2. Atmospheric temperature, with mean, maxima, and minima for days, months, seasons, and years, together with records of freezing, cold, hot, and very hot days, and durations of same. 3. Means of temperature and of evaporation (wet-bulb thermometer), for the purpose of approximately representing the temperature of the person in hot weather. 4. Records of sunshine and cloudiness (with percentage of clouds). 5. Precipitation of rain and snow, including daily, monthly, and seasonal averages, fog, hail, and duration of snow-covering. 6. Wind,—velocities, direction, and duration. He urges the necessity of adding meteorology to the ordinary curriculum in the public schools,—a study now almost neglected.

Physiological Effects of Air Vitiating by Respiration.—Haldane and Smith²⁴⁷_{v.1, No.2} relate a series of experiments to determine the physiological effects of air vitiated by normal respiration and perspiration, upon which they claim that the evil effects of “crowd poison” are due to the excess of carbonic acid rather than to the presence of an organic body or bodies given off as a respiratory product. The following are the chief conclusions at which they arrived: 1. The immediate danger of breathing air highly vitiated by respiration arises entirely from the excess of carbonic acid and deficiency of oxygen, and not from any special poison. 2. The hyperpnœa is due to an excess of carbonic acid, and is not appreciably affected by the corresponding deficiency of oxygen. The hyperpnœa begins to appear when the carbonic acid arises to from 3 to 4 per cent. At about 10 per cent. there is extreme distress. 3. Excess of carbonic acid is likewise the cause, or at least one cause, of the frontal headache produced by highly vitiated air, for hyperpnœa from defective oxygen begins to be appreciable when the oxygen in the air breathed has fallen to the point which seems to differ in different individuals. In the case of one of ourselves (the authors), the hyperpnœa became appreciable at about 12 per cent. and excessive at 6 per cent.

Microbeless Islands.—Contsaud⁶_{Mar.11} has made a study of the bacteriological property of the atmosphere in the Arctic regions. Analysis of the air, water, and soil of Spitzbergen brought to light the extraordinary poverty of these regions in bacteria.

Whilst, according to Miquel, the air of the streets of Paris contains, on an average, 51,000 bacteria, that of the Arctic Seas contains only 3 per cubic metre. As to the water of Spitzbergen, not only is it devoid of any pathogenic micro-organisms whatever, but all bacilli are absent. In the water of the island of Jean Mayen, however, there were discovered the bacterium termo and a few short and mobile bacilli. The bacillus subtilis, so commonly met with in the different countries of Europe, was undiscoverable in the soil of those regions. At Jean Mayen there was found in abundance a leptothrix composed of long filaments, irregularly twisted, about $1\ \mu$ in diameter, producing elliptical and highly refracting spores. This species grows, on gelatin, into dense colonies, which possess no liquefying properties, but develop during growth a characteristic brown coloration.

The Smoke Nuisance.—The increasing consumption of soft coal in the manufacturing towns of America has brought forward the same question of nuisance from the smoke as has been agitated in English towns. Experiments with the Fletcher smoke-consumer at Bolton, England, conducted by a local government board, showed that smoke could be practically suppressed. The sanitary inspectors of London have been provided with standard diagrams of smoke-shades to be used in noting atmospheric conditions of density, under the provisions of the Public Health Act.

SEWAGE.

Sanitary Condition of the Berlin Sewage Farms.—In a paper read before the British Institute of Engineers by H. A. Roechling, C.E., this subject was comprehensively treated, ²⁰³⁹ and the sanitary portion of the paper affords some interesting facts. The effects of sewage farms upon neighboring communities begets constant inquiry, as well as opposition, from those residing contiguous to localities where one is proposed to be established. The health of those living on the Berlin farms is the special object of that portion of the paper, and the period covered is five years among a population (average) of 1580 persons, of which 68 per cent. were men, 18 per cent. women, and 21 per cent. children. The death-rate decreased from 11.24 to 4.81 per cent. during the period, and of the seven principal zymotic diseases the death-rate decreased from 4.32 per cent. to zero. Only one died from typhoid

fever. The number of cases of disease per annum was 48, of which the prevailing order was measles, scarlet fever, diphtheria, and, lastly, typhoid fever.

Diphtheria and Sewer-Gas.—In an article describing a series of experiments on the relation of sewer-gas to diphtheria,^{59 Jan. 28} Louis Fischer reports some very interesting results, which go far toward confirming the intimate connection between cause and effect, hitherto in the category of the theoretical. Having had cases of this disease in a house previously infected on several of its floors, he first examined the general air of the apartment by Koch's method, modified by Hesse, using agar-agar as a nutrient film. He found colonies of almost a pure culture of streptococci, staphylococci, and in one case the characteristic Löffler bacillus. This latter was used to inoculate a rabbit that shortly after died with distinct symptoms of diphtheritic infection. Out of a total of forty bacteriological examinations made by him in different houses at or over drain-pipes or leaky traps, he records the following result: 1. Twenty of these exposures were negative, 12 yielded pathogenic bacteria, 8 more pathogenic micro-organisms, principally fæces bacilli, and numerous foreign bacilli, micrococci, and saprophytes, which could not be differentiated. 2. Some of the 12 specimens containing pathogenic bacteria yielded diphtheria bacilli (Klebs-Löffler), 1 of them typhoid bacilli in almost pure culture, associated fæces bacilli, and other cocci. 3. In 3 specimens he had streptococci, and in 4 specimens staphylococci, which could be easily distinguished and cultivated in the usual manner. 4. His animal experiments were very interesting and instructive, and aided him in determining the pathogenic condition of the bacilli, especially in one case which died of typical paralysis of legs. He thus concludes by asking, "If tubercle bacilli can infect after sputum dries and liberates tubercle bacilli, does any one doubt that a membrane expectorated on to bed-clothes, or on to the floor, or on the carpet, and then thrown into the sink, might not in a warm room be again liberated and inhaled?"

DISINFECTION.

Municipal Disinfectors.—The growth of knowledge of the life and properties of disease germs has developed the practical application of germicidal apparatuses in communities. M. A. Martin,^{10 Feb. 25} in an article on this subject, mentions the efficacy as well as the

popularity of the Parisian method of disinfecting a suspected house or locality. The chief feature of the proceeding is by steam under pressure for all textures, stuffs, bedding, and the like; mercuric chloride (1 to 1000) for all other objects and infected places, and cleansing by aid of cupric sulphate (50 to 1000) for water-closets and soiled utensils. In 1892 the number of disinfections reached 18,464. In addition to the disinfection for cholera and other graver diseases the work has been extended to ordinary transmissible diseases, including pulmonary tuberculosis. Speaking more at length ¹⁰⁰_{Feb. 23} of the sanitary outfit of the city of Paris, Martin lays great stress upon the antiseptic precautions that should be taken in all affections of the respiratory passages, as whooping-cough, diphtheria, croup, pneumonia, and even common "colds." He thinks that buccal and pharyngeal antiseptics should be practiced, in all these cases, by the use of boracic and salol solutions.

The city of Quebec, Canada, has lately provided itself with a large, stationary, steam, disinfecting chamber for municipal use, of the type employed at the Dominion quarantine stations, of the capacity of eleven hundred cubic feet.

Quarantine Stations.—Surgeon-General George M. Sternberg, U. S. Army, gives a valuable contribution ¹_{Jan. 21} to the literature of "Disinfection at Quarantine Stations," based upon the results of "practical" tests in the bacteriological laboratory, in which he demonstrates clearly the great value of sunlight and air as factors in the death of the cholera spirillum when placed under conditions of existence similar to those in fabrics, articles of clothing, merchandise, and food. His experiments consisted in placing small squares of sterilized woolen blankets, moistened with bouillon cultures of the spirillum, in sterilized Petri dishes and exposing them to the direct sunlight (temperature, 82° F.—27.8° C.) and in a dark laboratory-closet. No development occurred in the sunlight tests after four hours, nor in the dark-closet tests after forty-eight hours. The same cultures on pieces of blanket placed in sterilized glass tubes, closed at each end with a plug of cotton, exposed to sunlight and the dark closet, resulted in the same data. That it was not due to the heat of the sun was satisfactorily shown by experiments carried on, with the temperature at 60° F. (15.6° C.), in December. Similar experiments with cotton pledgets produced like effects. He ascribes the result obtained in the dark closet to

desiccation, and of the effects of sunlight he says: "The fact that the germicidal action of sunlight depends largely upon the presence of atmospheric air and moisture makes it appear probable that it is due to the production of ozone, rather than to the direct action of sunlight upon the micro-organisms exposed to it."

In this connection the tests of Geisler ⁵⁰_{B.11,'92} are interesting, as showing the effects of sunlight and electric light upon bacteria. All of the rays exercise a restraining influence upon the development of the typhoid bacillus, red excepted, the effect being greatest at the violet end of the spectrum. Surgeon-General Sternberg relates several other corroborative tests made by him, by means of which, by a process of exclusion, he was able to determine that the effect of the sun's rays upon the spirillum was direct, and not through any changes in the culture medium made by the sunlight. He therefore concludes, on this point, that desiccation is a reliable method of destroying the cholera spirillum, and that the International Sanitary Conference of Rome was justified in the conclusion that "disinfection of merchandise and of the mails is unnecessary," if the merchandise was clean and dry when received on shipboard for transportation, and if it arrive at our ports in the same condition; also, that free exposure to fresh air and sunshine is one of the most reliable methods of disinfecting articles which have attached to them the cholera spirillum.

For the practical application of these laboratory tests he lays down the proposition that "the washing of the exterior of packages of merchandise with a solution of mercuric chloride, and the fumigation of the mails with sulphur dioxide, which has been insisted upon by some sanitarians in this country, appears to us to be an unnecessary procedure, unless the merchandise has been exposed to infection by the dejecta of cholera patients during the voyage or after its arrival at our ports."

Upon the question of steam disinfection of articles of clothing he asks, in view of the experiments recorded as to the effects of sunlight, air, and desiccation, whether the exactions made by bacteriologists and sanitarians, with reference to the use of steam as a disinfecting agent, are not extravagant, and whether there is not some better way of disinfecting clothing, etc., in cholera. It is well known that the thermal death-point of the cholera spirillum in a moist condition (bouillon culture) is 52° C. (125.6° F.), the

time of exposure being ten minutes. It is with certainty destroyed in a very brief time by a temperature of 60° C. (140° F.). "The demand, therefore," says Sternberg, "that it shall be subjected for half an hour or more to a temperature of 100° C. (212° F.), or to steam under pressure at a higher temperature, would certainly be extravagant if the only question related to the destruction of the spirillum by the disinfecting agent. It is something like asking for a sledge-hammer for the purpose of killing a mosquito. Such an instrument would be certain death to the insect, but it seems a waste of energy to use it. We do not need such a tremendous blow, but we must be very sure that the blow is struck in the right place, otherwise the insect will escape uninjured, while serious damage may be done in the ineffectual effort to kill it."

Coming down to the comparative value of steam and dry heat as a destroying agent for the cholera spirillum, he calls attention to the fact that the experiments of Koch and Wolffhügel (1881), as to the efficiency of dry heat, were made before the cholera spirillum was discovered; and that, because it required such temperatures as 120° to 140° C. (242° to 284° F.), maintained for several hours, to destroy various micro-organisms, dry heat has been abandoned. But our knowledge of the biological characteristics of the cholera spirillum enables us to recast our requirements; and, therefore, he argues that disinfection would be accomplished quite as effectually by the free exposure of woollen garments, blankets, etc., in a hot-air drying-oven or chamber, to a temperature of 80° to 100° C. (176° to 212° F.) for half an hour or more, being careful that no two articles were piled one upon another, for the penetrating power of dry heat is very slight. If the hot-air oven were provided with an exhaust-pump, the drying process could be effected more promptly. Or it might be so arranged that a current of hot, dry air should pass over and through the articles to be disinfected.

In the absence of such a disinfecting chamber, and in favorable weather, such articles could be exposed to the sun and air upon clothes-lines. He also considers it unnecessary to disinfect the interior of ships to the extent done at present, when cases of cholera occur on board, believing that sunlight and air should be considered as sterilizing factors. He thinks that the steerage and other compartments occupied by the sick should be disinfected by

proper solutions, "but," he says, "it hardly appears necessary to deluge a whole ship with a solution of corrosive sublimate because one or more cases of cholera have occurred in the steerage, or to blister the paint in the cabins and injure the dry and clean curtains, stuffed furniture, etc., when no cases have occurred in this part of the ship."

These views of such an eminent bacteriologist must attract the attention of sanitarians, as they are contrary to the present established practices of quarantine authorities, and, in view of this, Sternberg hopes that his opinions will not be used to defeat those necessary measures of disinfection upon which we must still depend for protection. It certainly ought to exercise a restraining effect on the petty restrictions upon commerce and travel and individual rights which are enforced by some communities through ignorance or fear.

Disinfection of Rags by Sulphurous Dioxide.—James C. Kellogg, United States Consul at Stettin, Germany, recently made a series of qualitative and quantitative analyses of disinfected rags, which had been disinfected by the different rag-exporters of that city, under his personal direction and supervision. This disinfection of rags has always been made in the evening. The rags, after the disinfecting-rooms are closed and sealed, are left exposed during the night to the sulphurous-acid fumes. Previous to the disinfection, the rooms are made, as far as possible, air-tight.

His experiments were made in order to test the efficacy of the disinfection of rags by means of sulphurous-acid gas, as prescribed by the United States Treasury Department circular of August 19, 1892. He reports ⁸¹_{June} that he conducted his tests upon samples of rags placed upon racks at various heights in the room, and from the interior and exterior of the piles. 250 grammes (8 ounces) of each sample were macerated with 1000 grammes (2 pounds) of water in a glass vessel; the percolate thus obtained measured 200 centimetres ($6\frac{1}{2}$ ounces), which represented 50 grammes ($1\frac{1}{2}$ ounces) of disinfected rags; to this 200 centimetres ($6\frac{1}{2}$ ounces) of percolate 5 centimetres ($1\frac{1}{4}$ drachms) of dilute sulphuric acid were added, transferred into a retort, and, by means of a Leibig condensator, distilled until the distillate amounted to 150 centimetres (5 ounces); to this 50 centimetres ($1\frac{1}{2}$ ounces) were added, increasing the volume of the liquid to 200 centimetres

(6½ ounces), which was used for the tests. Reagents of nitrate of silver, chloride of gold, and nitrate of mercury were employed by him in testing the presence of sulphur dioxide. In all the qualitative tests he found it present. In the quantitative experiments five samples from the interior of the rag-piles produced an average of 0.044 gramme ($\frac{2}{3}$ grain) of SO_2 in 25 grammes (6½ drachms) of rags, and five from the exterior produced an average of 0.061 gramme (1 grain), from which he concludes that the disinfection by this process is effective.

EPIDEMIOLOGY.

Insects as Carriers of Infection.—Some years ago R. L. Maddox⁴⁰⁰ May 13, '86; Oct. 14 read before the Royal Microscopical Society papers on “Experiments on Feeding some Insects with Curved or ‘Comma’ Bacillus,” and an extension of the above paper under the title, “Further Experiments on Feeding Insects with Curved or ‘Comma’ Bacillus.” This subject has lately received further notice at the hands of Surgeon-General William Moore,² June 3 who has had the advantage of a long professional experience in India. He states that as far back as 1858 he had observed the necessity of protecting the cooking-barracks for the army from flies, and continues, “When mentioning the necessity of protecting food from flies, I urged the probability of flies coming fresh from the evacuations of a cholera-stricken person, and so conveying the cholera poison to the articles of food they might next investigate. My impression, long held, that flies convey cholera poison receives corroboration from the researches of Sawtschenko. This observer states that the specific bacilli could be demonstrated as late as the fourth day after feeding flies with pure culture. Flies were fed on sterilized broth after bacilli had been supplied to them; preparations from these flies showed immense quantities of bacilli which had multiplied on the bodies of the flies. Cholera bacilli taken from the bowels of these flies killed guinea-pigs as quickly as the original culture. In connection with the matter it may be mentioned that cholera chiefly prevails when flies are most numerous.

“If cholera may be thus spread, it is certainly probable that other diseases may be disseminated in a similar manner—enteric fever, phthisis, anthrax, leprosy, for example; especially in a

country where, outside hospitals, no care is taken as to the disposal or disinfection of excreta, or as to the disinfection and washing of soiled clothing. Flies seize every opportunity of investigating all kinds of filth."

It is not at all improbable that isolated cases of cholera, or typhoid fever, and kindred diseases may be explained by the conveyance of the germs of these diseases by flies.

Changes of Type in Epidemic Diseases.—A course of four lectures (The Milroy) was delivered on this subject ^{Feb. 24; Mar. 4, 11, 18} by B. A. Whitelegge, of London, in which the author brought to his aid the results of extensive researches into the history of past epidemics of contagious and infectious diseases occurring in the civilized world during the present century. He discusses typhoid, typhus and scarlet fevers, diphtheria, measles, and small-pox in their relations to external conditions, seasonal variations, dose poison, susceptibility of individuals and classes. Upon the subject of small-pox he says that the type seems to be stable, rising and falling in intensity if traced through long periods of years, the intensity being indicated even more by power of epidemic diffusion than by severity of attack; but apart from these long cycles there is a tendency to shorter cycles of four years or so, which may or may not prove to be accompanied by temporary increase of intensity and are probably governed by the accumulation of susceptible persons and other external conditions. Lastly, there are seasonal changes regulated by the facilities for diffusion, and not attended by any change of intensity.

In discussing measles he expresses the opinion that "measles presents many points of analogy with small-pox. They are alike in their independence of soil, water infection, and milk infection; in their relation to age and sex; in the duration of the intervals between infection and attack, and also between the onset and appearance of the rash; and in the primary seat of eruption. As regards the seasonal curve they have, at all events, the autumnal minimum in common. They are not unlike in the evidence which they afford of comparative constancy of type."

On the subject of the accumulation of susceptible persons, he makes this interesting observation anent the theory that closer aggregation of persons in-doors in the colder months determines the incidence of infectious diseases at those seasons: "Perhaps

the most unequivocal instances of 'seasonal' waves dependent upon social conditions are those which arise from the difference in risk of exposure to infection on Sundays as compared with other days of the week. Thus, the rash of small-pox has been stated to appear most commonly on Sundays among domestic servants, the usual interval between infection and rash being fourteen days, and the chance of out-door infection being often limited to Sunday. The notification records of Nottingham show a very decided minimum in the number of onsets of scarlet fever occurring on Wednesdays, corresponding, as it would seem, to a minimum risk of infection on Sundays."

Referring to the values of statistical conclusions made by sanitarians upon the results of preventive measures by a comparison of periods before and after their adoption, he makes the following pertinent criticism, and it should be constantly before health officers, who are ever anxious to parade the results of the operation of the health laws. He says: "For want of a better basis, death-rates are often used as a measure of prevalence, on the tacit assumption that the case mortality and type remain constant,—an assumption which is far from being sound. And in taking the mean of a number of years as representing the average mortality from a given disease some regard must be paid to its cycles of increasing and lessening energy. It would be unsafe to draw conclusions as to the effect of preventive measures upon scarlet fever, for example, from the comparison of periods shorter than fifteen years, seeing that, until lately, the tendency was to a cycle five or six years in duration; and as each successive wave after 1870 was lower than its predecessor, and the rhythm has now ceased to be evident, other elements of uncertainty come in. For the real question at issue is, Has the course of the disease been different to that which it would have followed had the supposed preventive measures not been adopted? It is scarcely possible to answer this question by crude statistics of deaths, for quality as well as quantity have changed, and social as well as climatic influences are far from constant." His conclusions are thus summarized: "1. Epidemic prevalence may be brought about either by increased potency of the disease itself or by increased mechanical facilities for diffusion. 2. Epidemics of the latter class, including water epidemics, milk epidemics, and, as a rule, seasonal prevalence, are attended with

lowered case mortality, because the conditions under which they occur imply a lessened average susceptibility, and therefore a less-severe average attack. 3. Underlying all great epidemics there is a change of epidemic type, a change in the quality of the disease itself. 4. There is evidence of a like change on a smaller scale in most, if not all, epidemic diseases, the intensity rising and falling at intervals which are not necessarily uniform for the same disease and are very different in different diseases. 5. Whether on the larger or smaller scale the intensification is marked by greater severity of attack, greater power of overcoming comparative insusceptibility, and greater power of epidemic diffusion. 6. Whilst some diseases are capable of rapid or even abrupt changes in intensity, others are not; and this distinction serves to mark off broadly two principal groups,—those which are mobile and those which are comparatively constant in type. 7. The first group—that of diseases which are capable of most rapid change in type—includes those which are most nearly allied to saprophytic life; most readily cultivated in artificial media; most dependent upon filth conditions; most able to infect soil, water, milk, and lower animal; most liable to relapses, and least protective. 8. Diseases of this class may be highly modified, and some of them may assume and maintain a form so slight that their true character is unrecognized. 9. Under favorable conditions their intensity may slowly or suddenly increase, giving rise to epidemics of severer type. 10. Amongst diseases of this class an epidemic normally begins and ends with the milder forms, the more-severe attacks occurring at the time of greatest prevalence. The severity and prevalence rise and fall together. 11. In the second group, amongst diseases of more-fixed character, extreme modification of epidemic type does not occur; but individual attacks may be extremely mild, owing to high resistance. 12. Amongst such diseases there is evidence of a rise and fall of intensity if the epidemic course be traced for a term of years, perhaps covering several minor epidemics. 13. In these brief outbursts of diseases of more-constant type there is little, if any, change of intensity comparable to that of the mobile class, the prevalence being determined and controlled mainly by external conditions, but the type being that of the prevailing phase of a broad cycle.”

The four lectures are a distinctly valuable contribution to the philosophical study of the evolution of morbid conditions.

Periods of Incubation and Infectivity.—This subject has been considered at length before the London Clinical Society, ²⁰³⁶_{v.26} in a report based upon replies to a circular-letter issued in 1889. The system upon which the summaries are prepared has been to take first those cases in which the exposure to the source of infection was for a short time—a few minutes or hours—at a known date. These have been made “the basis of the conclusions drawn as to the duration of incubation, while other histories, in which only the date of the commencement or cessation of exposure to a source of infection was given, have been used for contributory evidence.” The duration of infectiousness is also investigated by the light of the data supplied, and the length of time which a patient who has suffered from the disease should be isolated, the period during which a susceptible person exposed to infection should be quarantined, the liability to the retention of infection in clothes, and to its dissemination by milk and water are also considered. Some of the conclusions of the report are necessarily open to controversy. The assignment of seven days as the utmost proved limit of the duration of the period of incubation in diphtheria and scarlet fever will probably not meet with universal acceptance. The acceptance, even under reserve, of so short a period of incubation of enteric fever as five days is also rather astonishing, and we should be curious to see further well-authenticated instances of such a period. In this connection, also, arises the very interesting question of the variation of the period of incubation in relation to the “dose” of infection received,—a topic only dealt with very briefly in the report. The view adopted as to surgical and puerperal scarlet fever is, perhaps, less open to controversy at the present time than was the case a few years ago, the phagocytic doctrine affording a possible explanation of an apparent anomaly.

Period of Detention of School-Children Having Contagious Diseases.—In response to a request from the Minister of Public Instruction, A. Ollivier read before the Academie de Médecine, ¹⁰_{July 25, 26} a paper upon the period of isolation necessary for children of the public schools and lyceums who are suffering from contagious diseases. He stated the following to be his conclusions:—

A. 1. This period, counting from the onset of the malady (first day of invasion), should be forty days for scarlet fever, small-pox, varioloid, and diphtheria. 2. It should not be more

than sixteen days for measles and chicken-pox. 3. Concerning whooping-cough, isolation should be prolonged three weeks after the cessation of the characteristic spasms. 4. It should be maintained, in the case of mumps, for ten days after the disappearance of the local symptoms.

B. 1. The following hygienic measures should be taken before scholars are permitted to re-enter their schools: nasal, buccal, and pharyngeal lotions, with antiseptic solutions; soap-baths with general friction, to include all hairy portions; rigorous disinfection, by a steam-chamber under pressure, of the clothing which the student wore at the time he fell sick. 2. The isolation chamber should be thoroughly aired; the walls and furniture washed with a solution of corrosive sublimate, 1 to 1000; the bedding, curtains, and mattresses should pass through the steam-chamber.

The Academy adopted the conclusions of Ollivier's report.

E. W. Chambers, Coroner of Calcutta, formulates the following *schema* of rules for the prevention of contagious or infectious diseases in public schools, ²³⁹_{Feb.1} viz. :—

If a child has suffered from any of the following diseases at home, or in a public hospital, or in any house where such disease or diseases have prevailed, he or she shall not be allowed to attend school, or to be re-admitted, until after the specified periods of quarantine subsequent to the recovery of the child in question, and such quarantine shall apply to other inmates of the afflicted house, no member of which shall approach the school till the expiry of the quarantine period from the last appearance of the disease:—

1. Measles, after three weeks. 2. Scarlet fever and German measles, after four weeks. 3. Mumps, or other glandular febrile disorder of a contagious nature, after three weeks. 4. Diphtheria, after six weeks. 5. Small-pox, after four weeks. 6. Chicken-pox, after four weeks. 7. Whooping-cough, after six weeks. 8. Ophthalmia and granular lids, after one week. 9. Epidemic influenza, after two weeks. 10. Typhoid, relapsing, and typhus fevers, two weeks. 11. Fever complicated with dysentery, after two weeks. 12. Erysipelas, after four weeks. 13. Cholera, after two weeks.

All clothing, bed-linen, etc., used in the above instances of disease, shall either be destroyed or satisfactorily disinfected before

they are brought into school. All cases of chronic sore-eyes and purulent ophthalmia, as well as scald-head, eczema, ringworm, and skin eruptions of any kind, should be excluded, as these diseases may spread rapidly and become a source of much trouble to the institution.

VACCINATION AND SMALL-POX.

Vaccination as a Protection to Children.—The debate in the House of Commons ¹⁵_{June} on the question of compulsory vaccination, together with the proposal for legislation based on the fifth report of the Royal Commissioners on Vaccination, raises a number of important considerations as to the influence of compulsory vaccination in the protection of child-life against small-pox. The maintenance of the system of compulsion ought to be regarded as essentially aimed at protecting against a loathsome and fatal disease that portion of the community which is unable to protect itself. Indeed, if small-pox only attacked persons at adult life, when, presumably, individuals are capable of forming a reasonable judgment of their own and of acting upon it, vaccination might be left for adoption or neglect, just as each individual should care to decide.

The results of the compulsory vaccination of children and infants in Great Britain and its effects upon the community at different ages are shown in the following table ²⁰⁴¹_{1st Rep., p.114} :—

MEAN ANNUAL DEATHS FROM SMALL-POX AT SUCCESSIVE LIFE-PERIODS, PER MILLION LIVING AT EACH SUCH LIFE-PERIOD, 1847-53, 1854-71, 1872-91.

PERIOD.	All ages.	0-5	5-10	10-15	15-25	25-45	45 and over.
1. Vaccination optional, 1847-53 ¹ .	305	1617	337	94	109	66	22
2. Vaccination obligatory, but not efficiently enforced, 1854-71 . . .	223	817	243	88	163	131	52
3. Vaccination obligatory, but more efficiently enforced by vaccination officers, 1872-91	89	177	95	54	97	86	38

[¹ Optional vaccination begins with 1847.—ED.]

The saving of life amongst children in that kingdom, as shown by three decennial periods, arranged so as not to split the epidemic of 1871-72, which happens in the preceding table, is evidenced by the following table:—

SMALL-POX DEATHS IN ENGLAND AND WALES PER MILLION LIVING AT 0-5 YEARS.

PERIOD.	0-5 years.
1851-60	1034
1861-70	654
1871-80	527

It is further shown by the same tabulations that among three classes of children, first under five, second from five to ten, and third from ten to fifteen years,—that portion of the community who, by reason of age, came within the operation of the vaccination act of 1870,—there has been a saving of life at the rate of no less than 89, 72, and 43 per cent., respectively, as compared with children at corresponding ages who were born before the period when vaccination became compulsory.

Under these circumstances vaccination as a protection against small-pox, and above all against small-pox death, must, in the case of our infant and child population, be regarded as a thing which is proved beyond dispute.

Small-pox in the Negro Race.—At a discussion on small-pox and vaccination, which took place at the New York County Medical Society,⁵⁹_{Apr.20} Pedro J. Salicrup gave his experience as public vaccinator at Porto Rico, West Indies. He testified to the efficiency of vaccination in shortening epidemics and rendering the disease, when it did occur, less severe. The success had been greater since an institute had been established for the production of pure vaccine. The extent to which the disease had prevailed in Porto Rico was shown by the fact that about 40 per cent. of the population were pitted. Moreover, the mortality among those attacked was very high. The negroes seemed to be specially susceptible. J. A. Campbell contributed some experiences in South Africa. Vaccination had proved most efficient in Cape Town. Among the negro population small-pox had been most severe, 75 per cent. of those attacked dying; yet vaccination, when practiced among the native negroes, was as effectual as, or even more effectual than, among the whites, in preventing small-pox.

Surgeon-General Ogilvy, in an article on the kindred topic,²_{Mar.11} of vaccination among the natives of India, says: “My own experience in one of the Rajpoot native States, where I was residency surgeon and assistant to the political agent for some years, leads

me to the conclusion that the results of vaccination in that State were sufficient to overcome the prejudices of the most bigoted Hindus in the country, and to prove to them with the eloquence of facts, and in their own family circles, the beneficence of the system."

Small-pox among the Vaccinated.—In an editorial ²_{May 13} based upon the municipal returns respecting small-pox in the city of Manchester, England, for the year ended March 25th, it is shown (1) that, of 406 cases of small-pox, but one mild attack occurred in a revaccinated person, a man aged 51, who had received his secondary vaccination thirty-seven years previously; (2) the rate of mortality among the unvaccinated sufferers was more than four times that of the vaccinated; (3) had the latter class been fatally attacked at the rate of the former, the 14 deaths would have become 64; (4) granted 64 deaths among vaccinated persons at the rate of mortality affecting that class, and not 335, but 1531 cases would have been recorded; (5) primary vaccination gave absolute protection from fatal small-pox to all persons aged 10 years and under, a result very different being seen in unvaccinated persons; (6) primary vaccination secured complete immunity from attack during the first five years of life, and little short of this in the succeeding quinquennial period; (7) primary vaccination secured to 86 out of every 100 persons attacked a mild non-fatal form of small-pox.

The same is shown from the returns of Halifax, ²_{June 24} where out of 412 cases and 40 deaths the unvaccinated furnished 32 deaths; the vaccinated, 8 deaths. Small-pox was unable to attack fatally a vaccinated child under 10 years of age. In point of the character of the cases among the protected and unvaccinated, the effect of vaccination has been to insure the mildest form of attack in 76.4 per cent. of cases, as against 7.3 in unprotected persons, and semi-confluent and confluent cases have only amounted to 23.6 in place of 92.7 per cent. in unvaccinated individuals.

The evidence afforded in the current medical literature of the year on this topic is uniformly cumulative on the lines above indicated.

Cost of Small-pox Epidemics.—In a report to the Parliamentary Bills Committee by the British Medical Association, in relation to small-pox and vaccination, ²_{May 20} the cost of epidemics of

this disease is reduced to an illustrative basis. The committee of the association says: "We learn that the total expenditure incurred by reason of small-pox in 17 of the 32 districts, which had among them 1165 cases, amounts to £9962, averaging £8 11s. per case. We may reasonably regard £8 11s. as a modest sum, judging from the above figures, to be regarded as the cost of each case of small-pox; and, this being granted, we find that in one single quarter—that just past—the estimated 5093 cases of small-pox have cost the country £43,290. A continuance of such an epidemic for a year would entail the expenditure of upwards of £170,000, to say nothing of loss by reason of the death of bread-winners and other factors tending greatly to extend this amount. As it is, on the estimates we have framed, the cost, during the six months ended March 31st of the present year, on account of small-pox prevalence, was £61,245."

Accidents from Vaccination.—Commenting upon a fatality after vaccination, T. Colcott Fox, of London, gives a reasonable explanation ⁶_{Dec.10, '92} of some of the lamentable accidents that follow a vaccination properly performed in respect to selection of lymph and the technique of the operator. He says: "It is after the vaccination has been pronounced successful and the child dismissed, no doubt with admirable advice and instructions for protecting and healing the sores, that real danger is to be apprehended from various infections. There is a certain proportion of mothers to whom it is nearly or quite useless to give instructions. The only safe course to prevent the occasional disastrous ill effects is to keep the children under observation until the sores have healed up under the influence of proper treatment. Surely it is contrary to all modern teaching that children should be allowed to go about for weeks, and even months, with open sores, exposed to all sorts of possibilities of infection. A very simple trouble, and one which most commonly brings discredit on vaccination, is the auto-inoculation of pus producing the affection known as impetigo contagiosa. Formerly, I believe, it was the custom to see the vaccinated children later than the eighth day, and I strongly advocate that the vaccination should not be considered completed until the sores have satisfactorily healed."

In a leading article on the same subject, ²²_{Feb.15} this view of Fox is commended to the profession, and it would seem that physicians

ought to protect themselves and the cause of vaccination by some concerted measures looking to a more-careful observation of vaccinated arms.

Generalized Vaccinia.—This rare disease, a sequel of vaccination, was the subject of a discussion by the Clinical Society of London. ²²_{Feb.15} It is described as a discrete eruption, not confined to the points of inoculation, but extending to various parts of the body, which is characterized in typical cases by extreme severity and persistence, not unfrequently determining a fatal issue. It is so rare a complication that even so well known an authority on cutaneous affections as Colcott Fox cannot recall more than three cases in the experience of a life-time. This condition, as pointed out by Barlow, requires to be carefully distinguished from impetigo contagiosa, a less-uncommon sequel of vaccination, though, fortunately, of by no means the same gravity. In a very typical case adduced by Acland, who was intrusted with the inquiry, the original inoculation sores, after running a normal course for ten or twelve days, coalesced by the fourteenth day after vaccination, and this coalescence, always an untoward complication, was followed by the development of a large number of accessory pustules in the neighborhood of the site of inoculation. Still later, patches varying in diameter from less than an inch to four inches in diameter, made their appearance all over the body, and ultimately the little patient succumbed to exhaustion. Inquiry elicited the fact that humanized vaccine had been employed, this having been preserved and employed in the most orthodox fashion by the public vaccinator. Acland traced very clearly the course of the vaccine from the calf through forty-four removes down to its employment in the patient under consideration, with the result that in no instance could it be shown that anything abnormal had been noted, with one exception, four removes from this patient, in which case a very similar tendency to the formation of accessory pustules was observed.

The Prevention of Tuberculosis.—Armaingaud, who has acquired some notoriety in connection with an organized crusade against scrofula in France, has proposed a similar campaign against tuberculosis; has, in fact, inaugurated a like association, known as the Preventive League Against Tuberculosis in France. In a series of articles ¹⁸⁸_{Nov.13,20,27,'92} he discusses the general subject of the work

of such a society, the objections to it, and the arguments for it. He says that the principal work of the league is to popularize information about the danger of this great scourge. This is to be done by placing in the homes of the people printed matter, in a form suitable for preservation, preferably small pamphlets containing plain and simple facts about the method by which the disease may be spread, reference being had particularly to the sputum. He considers this method better than mural placards, which are liable to be defaced, destroyed, or covered over. In his opinion, answering objections to this plan, he says that this active propaganda of knowledge will not unduly alarm the public, but rather reassure them; that it will carry hope to those predisposed to the disease that there is escape from its assumed hereditary character if the proper precautions relating to its spread are observed by the general public. He advocates sea-side sanatoria for its special treatment, to be built by popular subscription or by government subsidies. To this, however, the league will not now devote its energies, but for the present confine itself to the dissemination of literature descriptive of the disease itself, its character, danger, and simple methods of domestic control of the infectious sputum. The developments of this beneficent organization will be watched with interest throughout the world, for all countries have a human prize at stake in dealing with this pestilence.

Glanders in Animals and Man.—In a paper read before the California Sanitary Convention F. A. Neife⁷⁷ discussed the diseases which are met with in slaughter-house inspection; among them are tuberculosis, anthrax, actinomycosis, and glanders. Regarding the latter he says: "This contagious and infectious disease, fatal in nearly every instance, is one of the most dreaded among the long list of maladies communicable from animals to man. It is of equine origin, and is caused by the presence in the system of a bacillus, the 'malleomyces equestris.' Glanders may present itself under two forms,—acute and chronic. Acute glanders can easily be recognized by the veterinarian on account of its variety of specific symptoms; but when we are called to pass an opinion on a case of chronic equina, it becomes a most difficult matter. Within the past few years a product somewhat similar to tuberculin has been prepared, which, when subcutaneously injected, will cause a specific hyperthermic condition absolutely reliable as a diagnosis."

YELLOW FEVER.

Other than in the countries where it is usually endemic, there has been no serious outbreak of this disease, except in Brunswick, Georgia, where it began the latter part of August and continued until the close of this report. There were reported 1001 cases and 53 deaths up to and including November 23d. Among the earliest victims was Assistant-Surgeon John W. Branham, U. S. M. H. S., who had been sent to investigate the outbreak.

Yellow fever has been officially reported as existing in the following places during the year ¹⁴⁶_{Oct. 20}: Brazil: Pará, Pernambuco, Rio de Janeiro, Santos. Cuba: Cienfuegos, Havana, Matanzas, Neuvas, Sagua la Grande, Santiago de Cuba. Costa Rico: Limon. Ecuador: Guayaquil. Mexico: Merida, Vera Cruz. Colombia: Bocas del Toro. United States: Georgia—Brunswick, Jesup, St. Simon's Island, Jekyll Island, Conquest's Camp, Satilla River. Venezuela: Caracas.

CHOLERA.

From the interim report issued by the Russian Minister of the Interior, the general conclusions of the cholera conference held at St. Petersburg last January are promulgated. Quarantine in principle was strongly condemned, and isolation and disinfection of actual cases were recommended as substitutes. Train inspection on the borders and the disinfection of the luggage of healthy passengers were equally condemned, exception being made in cases of large bodies of emigrants, troops, or convicts. The conference decided that it was unnecessary to prohibit the holding of fairs during an epidemic of cholera, for reasons "based upon experience in the last epidemic."

An International Sanitary Conference was held in Dresden in March. Representatives from England, Germany, Austria-Hungary, Belgium, Denmark, Spain, France, Greece, Italy, Portugal, Roumania, Russia, Norway, Sweden, Switzerland, and Holland were present, both a lay and professional membership. The conclusions of the conference, as submitted to the signatory powers, are embodied in two annexes; the first deals mainly with traffic of both persons and of goods across the continent of Europe and in sea-ports. In the first place, the contracting States bind

themselves to keep other countries informed, through diplomatic channels, of cholera and of its progress in their respective countries. No district is to be considered as infected merely because of the occurrence of isolated cases. A further resolution is to the effect that five days after the occurrence of the last fresh case any infected locality is to be considered as "immune." Restrictive measures are also only permissible as regards the given spot where cholera has occurred, and are not to be universally applied to a whole country because some small centre is affected. Other resolutions deal with the export of merchandise and goods. The most important, perhaps, of these, grants full liberty as regards international commerce to almost all articles except body-linen, worn apparel, and used bed-linen; and rags which are packed in the manner customary in the wholesale trade, as also new factory-waste and prepared wools, do not fall under the customary heading of "rags," and hence suffer no prohibition.

There is likewise a good deal of limitation as to disinfection of travelers' luggage, this process being no longer compulsory, except as regards articles which are suspected of actual infection by cholera discharges. So, also, the transport of goods, even though capable of conveying cholera infection, is not to be interfered with in their passage across one country into another, provided they are suitably packed and are not opened. Land quarantine can no longer be applied to travelers. Only persons suffering from actual or suspected cholera can be hindered in their journey, but persons arriving from cholera-infected places have to undergo local supervision at their residential towns by sanitary officers for five days, dating from their departure from the infected spot. Coming next to sea-traffic, infected ports are practically ignored, the control of a ship depending solely upon the sanitary state of the persons on board and of the vessel itself. Ships are divided into three classes. Infected vessels are those which have cholera on board or have had a fresh case within seven days. The sick are to be landed and isolated, and it is added that, "if possible," the remaining persons are likewise to be landed and kept under supervision for five days. Measures of disinfection are also to be carried out. The next class of vessels are the suspected vessels, namely, those which have had cholera on board, but on which no fresh case has arisen within seven days. Compulsory

measures are here limited to medical inspection, to such disinfection of linen and clothes as the medical officer of health may deem necessary, and to certain action with regard to drinking-water and to bilge-water. The third class of vessels are the "indemnes." They are such as have had no cholera on board, either in the port of origin or during the voyage. These may, quite apart from their bills of health, at once enjoy freedom from all restriction, excepting only such medical inspection, disinfection, and dealing with drinking- and bilge- water as may be deemed necessary; but any authority that chooses may, if they wish it, carry out a supervision of the persons who were on board for five days after their arrival, both in the case of suspected and clean vessels. The crew in either case may also be forbidden to go on shore, unless in connection with the service of the ship. Goods-traffic is, in the case of all these three classes of vessels, not to be hindered. Even in the case of infected vessels cargoes may be discharged, except in so far as they fall under the general regulations applicable to goods classed as "susceptible." There are also special provisions applicable to emigrant-ships or ships deemed to be unhealthy.

Annex 2 deals mainly with a matter affecting Russia and Roumania, namely, the traffic on the Lower Danube.

An editorial on the results of this conference¹⁵ says: "The International Sanitary Conference of Dresden, which has just completed its labors, indicates another advance in the direction which has, for well-nigh half a century, been adopted in England, namely, to place in the forefront of all measures for the prevention of cholera the maintenance of improved sanitary circumstances rather than the imposition of measures of restriction."

The Pan-American Medical Congress met in Washington, D. C., in September, and the only expression of opinion was a resolution adopted by the section on Hygiene and Public Health, and approved by the general body, recommending to the legislatures of the several nations of America the formation in each country of a department of public health having equal powers and rank with the usual executive departments in the government, and that its control should be in the hands of medical men specially selected for their knowledge and experience in the sanitary sciences.

Epidemics of Cholera.—Our review of the progress of the

epidemic of 1892 in Europe and Asia closed in the last issue of the ANNUAL (vol. v, F-34), with references to its scattered and smoldering embers in the countries principally affected, showing that it had not died out in Russia or the frontier Austrian provinces at the close of the year. The literature on this epidemic, descriptive, retrospective, and scientific, has been extensive, and afforded ample opportunities for discussion as to its etiology and the means of combating it most effectually. Perhaps the most notable polemic additions to the etiological discussion have been those made by Koch and von Pettenkofer in connection with the Hamburg epidemic, the former representing the "Contagionist" and water-supply theory, and the latter the "Localist" view of propagation. In an elaborate article on "Water Filtration and Cholera," ⁵⁸_{July 7} Koch points out that the epidemic in the summer and autumn of 1892 affected Hamburg severely, but almost entirely spared Wandsbeck and Altona. The three towns form practically one city, but Wandsbeck obtained its water-supply from a lake little liable to fæcal contamination and filtered the water, while Altona and Hamburg drew their water from the Elbe. The water for Hamburg was drawn from the river above the town, at a point where it was relatively pure; while Altona took water lower down, where the river was very much fouler, owing to its having received the drainage of Hamburg. At Hamburg the water was delivered for consumption unfiltered; whereas at Altona it was filtered efficiently, and during the epidemic of 1892 Altona escaped almost entirely the visitation of cholera; 500 cases occurred there, but as to 400 it could be shown that they were imported from Hamburg, or had been contracted, more or less directly, owing to the business communications. One group of workmen's houses in Hamburg was completely spared by the epidemic. This group, and this group alone, was supplied with water from Altona. The only other building in Hamburg supplied by the Altona water was a brewery.

Since the only difference which could be traced between the conditions under which the inhabitants of Hamburg and Altona were placed was the fact that the Altona water was carefully filtered, it was possible to set aside all cosmic and telluric influences, and all theories as to subsoil water and social circumstances.

Koch deduces from this the striking value of filtration of drinking-water as a preventive of the chief diseases (typhoid and cholera) spread by this means from man to man, and the necessity of regular bacteriological examinations of the effluent. He claims that the outbreak in Altona was due to the freezing of the filter-beds, and subsequent uneven thawing. The protection afforded by filtration "is not absolute, even under the most favorable conditions, but it can be made sufficient for practical purposes. His general conclusions are: 1. That the rapidity of filtration should never exceed 100 millimetres an hour, and that every filter should be provided with an apparatus for measuring and regulating the rapidity of filtration. 2. That, while in use, the water from every filter-bed should be submitted daily to bacteriological examination, and arrangements made for obtaining samples of water at the outlet from each filter. 3. That filtered water which contains more than 100 living microbes to the cubic centimetre should not be allowed to pass into the reservoir of filtered water. Speaking of filters for household use, Koch says that he knows of no such filter which could be relied upon to act satisfactorily for any length of time, and does not advise any one to trust to such filters when cholera is prevalent. Bored wells are spoken of in the highest terms, and a useful suggestion is made by which ordinary surface wells may be converted into bored wells. An iron pump-tube being put down to the bottom, the well is to be filled to the water-level with shingle, and then to the well-edge with sand.

The views of the "Localists" (so-called) are opposed to the water-contagion theory, and are stated at length by von Pettenkofer in an elaborate recital of his experiments with the cholera bacillus (comma of Koch), and his long and intimate knowledge of the epidemics of this disease in Europe during his professional career. His account of his personal experiments with the bacillus are most interesting. ³⁴_{Nov. 15, '92} He determined to take into his system a prepared agar culture of the spirillum, and drank this cholera mixture in the presence of witnesses on October 7th, it tasting like very pure water; fully believing that his advanced age—74 years—and the fact that he had had glycosuria for years entitled him to consider himself as a *corpus vile*. It is not necessary to detail his personal condition. While the bacilli were

found in his stools for eight or nine days, his health was not seriously affected. He tried this experiment in the highest interests of science, but with the belief that too much importance has been given to this bacillus as an etiological factor. He well says that "many confine their views of it to the behavior in a test-tube, and do not trouble themselves about the behavior of cholera in its epidemic extension." His views are reduced to a sort of algebraic expression, as follows:—

"Both parties are agreed that two things are needed to produce cholera epidemics,—a germ capable of propagation by human intercourse and an individual predisposition of persons,—which factors I call x and z , and the Contagionists rest satisfied with these two factors. The Localists, on the other hand, supported by numerous epidemiological facts, maintain that these two factors cannot cause or explain the outbreak of cholera epidemics, which is alone in question and which is occasioned by local and temporal circumstances, which I have called y . How y is connected with x or z , indeed, is not yet known, but we know very well, from numerous epidemiological experiences, what affects it. With the same reason as I assumed an x before the comma bacillus was known I now assume y , and cannot sacrifice it to x because the epidemiological centre of gravity lies in y alone. In immune places (Lyons or Stuttgart, for instance), or in non-immune places at immune times (in Hamburg and all over North Germany, in April, for instance), x and z are very harmless things. No epidemics break out there and then, even though much x comes and much z is present. I am convinced that the y emanating from certain places at certain times will be discovered one day by the bacteriologists, just as the comma bacillus was discovered by Koch."

He maintains that bacteriological research must go not only in the Contagionist, but also in the Localist direction, to clear up the mystery of y . The concurrent effect of the bad Hamburg water was not to be denied, but he claimed that the dilution of the germs, if they existed in the Elbe, was innocuous; that Hamburg itself, soil and houses, had become locally polluted. He calls attention to the fact that the comma bacillus was not found in the Elbe water or the Hamburg mains.

One of Pettenkofer's remarks is of special practical importance.

He states "that 42.7 per cent. of the cholera patients of the Hamburg suburb of Sankt Georg, who were taken to the neighboring old hospital, died; whereas, amongst those who were taken to the more-distant Eppendorf Hospital the percentage of death was 61.6. The mortality was lowest amongst those who were not removed from their homes."

Coming to the question of regulations, sanitary and police, to successfully cope with recurring epidemics of cholera, von Pettenkofer is strongly opposed to quarantines. The spread of the cholera germ is not to be prevented, he says, either in India or outside of it, by isolation, disinfection, cordons, quarantine, etc. Just as, in spite of custom-houses, goods are still smuggled over the frontier, so the bacteria and viruses will be smuggled through all our barriers.

He regards the millions expended on hunting down the x (germ) as wasted effort, and that it should be diverted to the work of making people and places immune.

Ferdinand Hueppe, of Prague, ⁴_{Nos. 4,5} discusses the etiology of the Hamburg epidemic. Without being able to say how or when, he believes that the Elbe became infected with the discharges of a mild case of Asiatic cholera which was not recognized early in the epidemic; but he honestly confesses that, as far as the infection of water had to be proved, bacteriology has failed to clear up the etiology of the epidemic.

He notes that not a case occurred in the emigrant barracks from their opening, June 20th, to August 25th. Hueppe points out that infection is like a chain consisting of several unequal links having an effect only when all links are present. First, there must be something promoting the infection, the x which lets loose the disease; the importance of this is recognized even by Pettenkofer. Secondly, the individual predisposition, that which Pettenkofer calls the z . Theoretically, x and z ought to be sufficient to produce an infection, but that is only the case in experiment, or, rather, seems to be the case. In fact, we need a third link,—that is to say, the various conditions under which the activity of the infection comes into play,—and Pettenkofer makes this third quantity, y , too narrow, giving to it the meaning only of a temporary local disposition. The importance of each of these links has been very different at different times and in the eyes of different schools.

The pathologists, who take their inspiration from Virchow, have overrated z and underrated y and x ; on the other hand, Pettenkofer and his followers have dwelt too much on y and far too little on the other two factors; whilst the bacteriologists, under the guidance of Pasteur and Koch, have exaggerated the x .

A striking feature in the cholera epidemic of this year has been the distribution of the disease in Europe and its manifestation in local outbreaks or as sporadic cases in many different places, and the tenacity with which it has clung to some of them without giving rise to any wholesale outbreak like that which characterized the cholera of last year in Hamburg, for example, where it looked like a case of water poisoning on a large scale.

That it would re-appear this year was regarded as certain, and the health authorities of the civilized world began to perfect measures against its farther spread. Hamburg, profiting by its severe lesson, has spent millions and exhibited great and commendable energy in completing her new water-works. The practical immunity of that city this year may be attributed to this in part, but as well to the extraordinary efforts put forth by the municipal authorities in keeping the city clean even in the face of resistance by the ignorant, culminating in several outbreaks and riots when these new hygienic regulations were being enforced by the corps of sanitary police.

In January an outbreak occurred at the Nietleben Lunatic Asylum, Germany, which obtains its water-supply from a branch of the river Saale, and resulted in 114 cases with 45 deaths. Both Pettenkofer and Koch hold opposite views of its origin, and Arndt, of Greifswald, expresses the opinion that it is "home-grown," and a lesson for the introduction of sanitary measures in like institutions. Cases were also occurring here and there along the Danube, in Galicia, and even in Hamburg.

In February there was a sharp outbreak in Marseilles, although vigorously denied by the local officials, in spite of the detected presence of the comma bacillus in the discharges of the victims. In Russia it clearly gained strength in the provinces of Ekaterinoslav and near Golodalokir. Up to the 7th of February the returns from fourteen provinces showed a total of 973 cases, of which 369 terminated fatally, and it was evident that it was retaining its hold on the frontier provinces of Podolia and Kief.

In March it appeared in the convict prison at Moscow, and showed itself in scattering villayets throughout the southeastern provinces. In the latter part of the month l'Orient, France, had a virulent outbreak, resulting in 70 deaths in two weeks, while Marseilles continued to have cases every few days. It is not unreasonable to hold that cholera may be endemic in Marseilles, in view of its history.

In April cholera broke out in certain Austrian provinces on the Russian frontier chiefly, and the disease spread over a large district of Southeastern Hungary, the cases being imported from Podolia. The epidemic in l'Orient spread to many neighboring communes, and to the 9th there were reported 478 cases and 178 deaths, and to the end of the month 307 deaths. In Russia, up to May 19th, cholera was reported in twenty out of the sixty of the provincial governments of European Russia, and from three in the Caucasus,—a total of 2388 cases and 733 deaths. Podolia was the greatest sufferer, with 1690 cases and 463 deaths.

In June the effects of the pilgrimage, which was unusually large this year, began to show the inevitable results at Mecca. On the 25th the number of deaths from cholera had reached 455 and later on rose to 1000, aggregating about 5000 in the month, but confined to Mecca alone. In Russia it was making no perceptible gain, though well scattered. In France it began to develop in Marseilles and some of the southern provinces bordering on the Mediterranean, and invaded Cette, Nimes, Toulon, Montpellier, Alais, and the Basses-Alpes. Altogether there were 343 deaths from cholera in all these affected regions during the first two weeks of the month. In July the disease continued to spread in Russia, and was officially declared "epidemic" in several provinces. In Moscow to July 21st there had been 151 cases and 39 deaths. At Mecca in one day this month 260 and at Jeddah 490 succumbed to the disease. In France the official report of cases showed its wide distribution, but in small numbers, the Valley of Andorra being particularly affected and all the communes heretofore named continuing to show cases, with the usual mortality. In August several districts in Hungary, including Budapest, were added to the category, while in Roumania the cities of Braila, Sulina, Czernowada, Galatz, and Tultcha reported cases in large numbers, but the type was mild, about one-third only dying. On the 19th a few

cases occurred in Berlin, and before the close of the month isolated cases occurred in the capital and suburbs. In Italy an outbreak in Naples, Alessandria, Aquila, and Campobasso occasioned some alarm, but it never assumed epidemic form. In September the towns of Grimsby and Hull, England, became infected and continued to have cases until the close of this report. In Italy the disease showed itself extensively in Leghorn, almost to the point of an epidemic. During the year the following localities have been officially reported as having cases of cholera ¹⁴⁶_{Oct. 20}:—

Africa.—Alexandria, at lazaretto; Mogador, at quarantine station; Saint Louis, and Goree-Dakar, Senegal.

Arabia.—Djeddah, Mecca, Medina, Mina; also, along the Hejaz.

Austria and Austria-Hungary.—Beregh, Bralia (Roumania), Dees, Doboka, Hattien-Kerec, Szaholes, Szalnok, Szatmar, Tisza, Vienna; also in Galicia and Bukowina, Budapest, Kis-Varda, Doreebad, Szaboles (county of), Marmoros (county).

Belgium.—Antwerp (city and province), Brussels.

Brazil.—Rio de Janeiro, San Paulo.

France.—Alais, Aubenas, Avignon, Bordeaux, Brest, Cadiè, Camaret, Cette, Chautenay les Nantes, Cuers, Hyèrès, Larcet, La Seyne, La Vallette, Limoges, Lorient district, Lyons, Marseilles, Mines, Mirepoix, Montpellier, Nantes, Pamiers, Pierre Benité, Privas, Salon, Sorgues, Toulon, Toulouse, Vannes district, Department of Basses-Alpes.

Germany.—Barmen, Berlin, Cologne, Donaueschingen, Duisburg, Geestemünde, Hamburg, Homberg (district of Moers), Neuss, Neuwied, Papiermühle, Solingen, Stettin, St. Goars, St. Goarshausen.

Great Britain.—Hull, Grimsby, Liverpool, London, Newcastle, Rotherham.

India.—Calcutta.

Italy.—Anna Capri, Alessandria (province of), Barra, Bubbio, Caivano, Campalasso, Capri (island of), Castellamare, Canerta, Cueno (province of), Feddio, Fresonaro, Furori Grotta, Gragnano, Gaeta, Genoa, Leghorn, Maddaloni, Montegioco, Naples, Origgio, Palermo, Pavia, Piedmont, Roccanerano, Rome, Rounigliano, Rouaverano, San Guliano Vecchio, San Salvatore, Sorrento, Sulmona, Torre Garfali, Torre Annunziata.

Japan.—Hiogo, Osaka.

Netherlands.—Ameide, Amsterdam, Avereest, Delft, Deventer, Dubbledam, Durgerdam, Elden, Giesendam, Hansweert, Kralingen, Koog a. d. Zaan, Leerdam, Molenaarsgraaf, Nieuwe-Wetering, Oudshoorn a. d. Rhijn, Ouwerschie, Puttershock, Renkum, Rotterdam, Rumpt, Rozendaal, Streefkerk, Ter Neusen, The Hague, Utrecht, Wonbrugge, Werkendam, Ysselmonde, Zuilichem, Zwijndregt, Zaandam.

Russia.—Governments of Astrakhan, Baku, Bessarabia, Charchoff, Cherson district, Don district, Etissavetpol, Ekaterinoslav, Grodno, Kalish, Kaluga, Kazan, Kharkoff, Kieff, Koutais, Kostroma, Kuban, Kursk, Kutaisk, Lomza, Minsk, Moscow, Movileff, Nicolaieff, Nijni-Novgorod, Novoherkask, Orel, Orenberg, Orloff, Perm, Penza, Petersburg, Plozk, Podolia, Podolsk, Plotavà, Radom, Redout-Kale, Riazan, Saratoff, Samara, Sebastapol, Simbirsk, Smolensk, Stavropol, Tamboff, Taurida, Terek, Tchernigoff, Tersk, Terscheu district, Tiflis, Tobolsk, Tomsk, Tula, Tver, Ufa, Vilna, Viatka, Vladimer, Volinsk, Volhymnia, Voronesh, Warsaw, Yaroslaff; cities of Batoum, Cronstadt, Ekaterinoslav, Helsingfors, Kertch Kieff, Moscow, Nijni-Novgorod, Poti, Rostoff, St. Petersburg, Sebastopol, Tiflis, Warsaw.

Servia.—Belgrada.

Spain.—Abando, Algorta, Arboleda, Arrigarriaga, Baracaldo, Begonia, Bilbao, Catalonia, Deusto, Echavarria, Erandio, Las Arenas, Lejona, Mungnia, Legueitio, Ortuella, Portugalete, San Salvador del Valle, Santurce, Sestao, Turre, Zalle.

Turkey.—Aboulhassib, Abovdjeruil, Abrufassié, Avassum, Bagdad, Bassorah, Constantinople, Chatra Amara, Djilila, Guèrmah, Hai, Hassan-Hayoun, Aamissieh, Kut, Menasin, Mohammerah, Mountefik, Nazrieh, Shouk-el-Sheouk, Smyrna, Tau, Zolen, Zubeir.

The United States, which was largely interested in this problem because she is the greatest receptacle of immigrants from these cholera-infected districts of Europe, determined to display her energies in the direction of stricter quarantine precautions, the increase of disinfecting stations, the closer surveillance of immigrants at ports of arrival, and, in addition, took the new and heretofore untried step of sending its agents abroad to the great ports of Europe to act as inspectors of emigrants, vessels, cargo, and the

disinfection of them prior to departure. The necessary legislation to accomplish this is found in an act which ²⁰⁵²_{Feb. 15} confers largely extended duties and powers upon the Marine-Hospital Service, acting under the direction of the Secretary of the Treasury. In addition to the labors devolving upon this service in quarantine work, the act referred to provides for the following:—

Section second provides that all vessels clearing from foreign ports shall be inspected by a consul or a medical officer appointed by the President, and obtain from him a certificate in duplicate as to its good sanitary condition, and freedom from infectious disease of its cargo, passengers and crew, and that the sanitary rules prescribed by the Secretary of the Treasury have been complied with.

Section third provides that the Supervising Surgeon-General of the Marine-Hospital Service shall examine all quarantine regulations of State and municipal boards of health; and, when occasion arises, under the direction of the Secretary of the Treasury, co-operate with and aid such boards in enforcing these rules, and such rules and regulations as may be ordered by the Secretary of the Treasury to prevent the introduction of infectious diseases from abroad or from one State or Territory to another.

Should any place or State have no quarantine or regulations, or should those which they may have prove inadequate, the Secretary of the Treasury may make such rules as, in his judgment, are necessary to be enforced by the local authorities. But should they fail or refuse to enforce them, the President shall adopt such measures as, in his judgment, may be necessary, and may detail or appoint officers for this purpose.

Section fourth provides that it shall be the duty of the Supervising Surgeon-General of the Marine-Hospital Service, under the direction of the Secretary of the Treasury, to perform all the duties, in respect to quarantine and quarantine regulations, which are provided for by this act.

Section seventh authorizes the President, if it be made apparent to him that the quarantine defenses against an infected country are inadequate, to prohibit, in whole or in part, both persons and property from said infected localities for such time as he may deem necessary. In other words, he may enforce non-intercourse with an infected locality during periods of extraordinary danger.

Early in the year the Surgeon-General detailed officers of the

Marine-Hospital Service to serve as medical advisers to the United States consuls at London, Liverpool, Southampton, Glasgow, Rotterdam, Hamburg, Antwerp, Bremen, Havre, Marseilles, Genoa, Naples, whose duty under the law, as just quoted, was to inspect vessels, cargoes, crews, and passengers of such ships as were bound for the United States, supervise disinfection of same, issue certificates thereupon, and sign bills of health. In addition to this corps abroad two medical officers, by arrangement with the government of the Dominion of Canada, were detailed for duty at Quebec, to certify to the disinfection of such immigrants as were destined for the United States *via* the St. Lawrence, after they had passed the Grosse Isle quarantine station and had their luggage steam-sterilized at Leon and Quebec. One of the principal duties of these officers was to give the Surgeon-General early information of the occurrence of cases of cholera at their several stations. The work done in this respect has fully justified the expectations of the framers of the law, and has proven to be a distinct success in other lines. In nearly all of the ports named above the entire sanitary control of steamers sailing for the United States has been placed in the hands of the officers of the Marine-Hospital Service. Upon their certificate of satisfactory condition as to cleanliness of ship, cargo, and passengers, has depended the issuance of a clean bill of health to enable them to enter a port in the United States.

STATISTICS.

YELLOW FEVER IN 1893.

(As reported to the United States Marine-Hospital Service.)

[illegible]

YELLOW FEVER IN 1893.—*Continued.*

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
UNITED STATES :												
Gulf Quarantine						1						
Key West Quarantine (e)								1			1	
New York Quarantine (f)						1						
Pensacola (g)												
Philadelphia—Lazaretto (h)												
Port Tampa (i)												
Satilla River, near Brunswick (j)								1				
FOREIGN :												
<i>Brazil.</i>												
Para	15	28	15	26	31	12	29	2	13	5		4
Pernambuco		3	2	13	14	24	21	5		1		
Rio de Janeiro						41	44	33	29	7	11	7
<i>Cuba.</i>												
Cienfuegos		1	1	3	10	22	44	39	47	13	8	8
Havana	17	7	5	8	24	74	122	99	70	47	33	7
Matanzas							1	4	2			
Nuevitas					1		1		3	2	1	
Sagua la Grande						1	4	8	12	19	13	3
Santiago de Cuba								14	9	6	5	
<i>Mexico.</i>												
Guayaquil								1	10	10	9	9
Merida					1							
Vera Cruz	7	4	10	10	22	31	29	10	9	12	4	
<i>Panama.</i>												
Bocas del Toro							1					
<i>Venezuela.</i>												
Caracas (k)												

(a) Assistant Surgeon Branham, U. S. M. H. S., died August 20, 1893. (b) July 13, 1893, arrival of brig *Darpa*, with body of captain, who died of yellow fever July 12th, still on board. Two cases on arrival. July 15, 1893, one new case. (c) Schooner *Hannah McLoon*, from Havana, arrived July 25, 1893, with body of captain, who died of yellow fever. (d) British bark *Galena* arrived August 11, 1893, with 2 cases of yellow fever aboard. (e) British barkentine *Antilla* arrived at Dry Tortugas, August 17, 1893, with 1 case of yellow fever on board; taken ashore and died. One case taken from British brig *J. H. Dexter*, October 3d; died October 6, 1893. (f) Steamship *Ardaugann* arrived July 9, 1893, from Cienfuegos, 1 death from yellow fever. (g) Two cases of yellow fever taken off Spanish steamer *Leonora*, arrived August 2, 1893. August 9th, 2 cases reported in the town. (h) Schooner *Ettie H. Lister*, from Georgetown, S. C., arrived August 15, 1893, with 3 cases of yellow fever on board. (i) Yellow fever reported at Port Tampa, August 20, 1893. Eight sailors sick on board ship *Markomania*, from Vera Cruz, after arrival at Port Tampa. One additional case, August 30, 1893—clerk on dock. (j) Captain of bark *Anita Berwind* died in August, 1893. (k) Yellow fever reported September 29, 1893.

CHOLERA IN 1893.

(As reported to the United States Marine-Hospital Service.)

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
UNITED STATES :												
Jersey City . . . . .	.	.	.	.	.	.	.	1	.	.	.	.
New York Quarantine (a) . . . . .	.	.	.	.	.	.	.	3	.	.	.	.
FOREIGN :												
<i>Africa.</i>												
Alexandria (b) . . . . .	.	.	.	.	.	.	.	.	.	.	.	.
Algeria (c) . . . . .	.	.	.	.	.	.	.	.	.	.	.	.
Dagana, Senegal . . . . .	.	.	.	.	.	.	62	.	.	.	.	.
Dalmath, " . . . . .	.	.	.	.	.	.	32	.	.	.	.	.
Goree Dakar, " . . . . .	.	.	.	.	.	.	5	4	.	7	.	.
Malam, " . . . . .	.	.	.	.	.	.	35	.	.	.	.	.
Mogador Quarantine Station . . . . .	.	.	.	.	.	.	.	.	10	.	.	.
N'Daen . . . . .	.	.	.	.	.	.	81	.	.	.	.	.
Podor, Senegal . . . . .	.	.	.	.	.	.	97	.	.	.	.	.
St. Louis, Senegal (d) . . . . .	.	.	.	.	.	.	22	.	.	.	.	.
<i>Arabia.</i>												
Hodeida (e) . . . . .	.	.	.	.	.	.	.	.	.	.	.	.
Mecca (f) . . . . .	.	.	.	.	.	5266	.	.	.	.	.	.
Yemen, Province of	13	.	.	.	.	.	.	.	.	.	.	.
<i>Austria and Austria-Hungary.</i>												
Budapest	29	7	2	29	.	.	8	174	319	296	11	.
Vienna (g) . . . . .	.	.	.	.	.	.	.	.	24	31	15	.
									2	.	1	.
<i>Belgium.</i>												
Antwerp . . . . .	.	.	.	.	.	.	1	23	33	.	.	.
Brussels . . . . .	.	.	.	.	.	.	.	.	10	6	1	.
Ghent . . . . .	.	1	.	.	.	.	.	.	.	.	.	.
<i>Brazil.</i>												
San Paulo (h) . . . . .	.	.	.	.	.	.	.	.	.	.	.	.
<i>Canary Islands.</i>												
Teneriffe (i) . . . . .	.	.	.	.	.	.	.	.	.	.	.	.
<i>England.</i>												
Greenwich (j) . . . . .	.	.	.	.	.	.	.	.	.	.	.	.
Grimsby (k) . . . . .	.	.	.	.	.	.	.	1	.	.	.	.
Hull . . . . .	.	.	.	.	.	.	.	2	8	.	.	.
Liverpool . . . . .	.	.	.	.	.	.	.	.	1	.	.	.
London	1	1	.	.	.	.	.	.	1	5	.	.
Newcastle-upon-Tyne (l) . . . . .	.	.	.	.	.	.	.	.	2	.	.	.
Rotherham (m) . . . . .	.	.	.	.	.	.	.	.	.	.	.	.
<i>France.</i>												
Alais . . . . .	.	.	.	.	.	16	.	.	.	.	.	.
Aubenas (n) . . . . .	.	.	.	.	.	.	.	.	.	.	.	.
Avignon . . . . .	.	.	.	.	.	1	.	.	.	.	.	.

CHOLERA IN 1893.—*Continued.*

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
FOREIGN :												
Basses Alpes (<i>o</i>)												
Brest			20	50					94	14	5	
Cadiere						1						
Celte						1						
Cuers						1						
Hyères						19						
Lambazellec (<i>p</i>)												
La Vallette							20					
Lorient, Town and District	17		52	75	16	2						
Lu nel (<i>q</i>)						1		1		1		
Lyons					10	136	138			2		
Marseilles		87				5						
Montpellier						24	60	139	120	21		
Nantes			2	12	9							
Nîmes					2							
Paris			1		1							
Pierre Benité (<i>r</i>)												
Quimper, Town and District				25	11							
Salon (<i>s</i>)												
Sorgues						8	3					
Toulon						2						
Toulouse					2							
Vannes, District of					9	2						
Vendee, Dept. of					12	6						
<i>Germany.</i>											81	5
Berlin								6	3			
Cologne									3			
Duisburg (<i>t</i>)												
Gleiwitz (<i>u</i>)											1	
Halle (<i>v</i>)	18											
Hamburg	9	1			1				40	15		
Magdeburg										1		
Neuss (<i>w</i>)												
Newsaltz												
Neustadt (<i>x</i>)										1		

(*a*) Steamship *Karamania*, from Naples, arrived at New York Quarantine, August 3, 1893. Three deaths from cholera *en route*. Eighteen cases and 3 deaths at New York Quarantine. Steamship *Russia*, from Hamburg, arrived in October, having had 5 deaths from supposed cholera *en route*. One case removed to Swinburne Island and died. (*b*) One case reported at Lazaretto, September 6, 1893. (*c*) Cholera reported June 30, 1893. (*d*) Thirty-five deaths daily reported during week ending July 29th. (*e*) Cholera reported May 25, 1893. (*f*) Cholera reported June 10, 1893. (*g*) Cholera reported August 21, 1893. (*h*) Twenty-two cases reported August 23, 1893. (*i*) Cholera reported November 20, 1893. (*j*) Cholera reported; 210 cases, 8 deaths. (*k*) Cholera reported August 31, 1893. (*l*) One death from cholera reported on board steamship *Myrtle Branch*, from Nantes, June 25, 1893. (*m*) Cholera reported September 2, 1893. (*n*) Cholera reported July 27, 1893. (*o*) Cholera reported September 19, 1893. (*p*) One hundred deaths since outbreak of epidemic. (*q*) Cholera reported in May, 1893. (*r*) Cholera reported July 16, 1893. (*s*) Cholera reported July 12, 1893. (*t*) One case at Duisburg. (*u*) Cholera reported November 8, 1893. (*v*) Cholera broke out at Insane Asylum, January 10, 1893. (*w*) Three cases at Neuss. (*x*) Cholera reported November 8, 1893.

CHOLERA IN 1893.—Continued.

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
FOREIGN :												
<i>Germany.</i>												
Solingen								1	6			
Stettin									6	55	13	
<i>India.</i>												
Calcutta	51	37	30	119	91	63	61	102	23	123	38	34
Madras											5	
Singapore		2	2	1	1							
<i>Italy.</i>												
Alessandria							16	2				
Caivario (a)												
Castellamare								7	3			
Cuneo							3					
Entragne			2									
Feddio							1					
Frésonara							1					
Genoa								4	2			
Leghorn									107	66		
Naples							4	78	29	6		
Palermo								46	194	302	24	25
Piedmont (b)												
Pisa										1		
Rome							2	10	5	7	5	4
Salmona								57	16			
San Salvator							3					
Sorrento								2				
Torre Garfalé							2					
Trapani										3		
<i>Japan.</i>												
Hiogo								2				
Osaka							7	4	1			
<i>Netherlands.</i>												
Amsterdam	1							1	1	1		
Rotterdam								7	24	2		
<i>Persia.</i>												
Teheren (c)												
<i>Russia.</i>												
Batoum						267	172	5307	3118	4278	1518	
Bessarabia							17		7	3		
Caucasus										44	80	
Don District							1					
Helsingfors									1			
Kursk							19					
Moscow							139	546	203	26	2	
Odessa												4
Riga									5			
St. Petersburg								38	578	199	15	12
Samara							4					
Saratoff							3					
Tula							1					
Warsaw								1	3	4	5	

CHOLERA IN 1893.—*Concluded.*

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
<i>Spain.</i>												
Bilbao (<i>d</i>) . . . . .	..	..	..	..	..	..	..	..	..	..	..	..
Catalonia (<i>e</i>) . . . . .	..	..	..	..	..	..	..	..	..	..	..	..
Vizcaya (<i>f</i>) . . . . .	..	..	..	..	..	..	..	..	150	181	..	..
<i>Servia.</i>												
Belgrade . . . . .	..	..	..	..	..	..	..	..	11	..	..	..
<i>Sweden.</i>												
Umea (<i>g</i>) . . . . .	..	..	..	..	..	..	..	..	..	..	..	..
<i>Turkey.</i>												
Amara . . . . .	..	..	..	..	7	1	..	..	..	..	..	..
Amarsia . . . . .	..	..	..	..	..	..	..	..	..	..	..	6
Bagdad . . . . .	..	..	..	..	..	..	..	71	667	11	1	..
Bassorah . . . . .	..	..	..	..	80	680	215	47	..	..	..	..
Chatra . . . . .	..	..	..	..	35	62	..	..	..	..	..	..
Constantinople . . . . .	..	..	..	..	..	..	..	..	107	101	303	..
Pera (<i>h</i>) . . . . .	..	..	..	..	..	..	..	..	..	..	..	..
Smyrna . . . . .	..	..	..	..	..	..	..	158	85	..	..	..
Trebizonde	91	..	..	..	..	..	..	..	..	..	..	..
Zubier . . . . .	..	..	..	..	..	42	..	..	..	..	..	..

SMALL-POX IN 1893.

(As reported to the United States Marine-Hospital Service.)

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
UNITED STATES:												
Boston, Mass.	2	..	4
Brooklyn, N. Y.	2	1	2	..	..	..	..	..	..	2	1
California	1	..	..	..	..	..	..	..	..	..
Chattanooga (<i>i</i>)
Chicago, Ill.	1	..	..	..	1	1	1	..	..	..	14
Connecticut	1	..	..	..	..	..	..	..	1	..	..
Hudson County	5	..	4	2	4	..	..	..	..	..	1	..
Lewis, Del. (<i>j</i>)
Newark, N. J.	3	..	1	..	..	..	..	..	..	..

(*a*) Cholera reported July 20, 1893. (*b*) Cholera reported June 26, 1893. (*c*) Epidemic reported October 6, 1893. (*d*) Cholera reported September 19, 1893. (*e*) Cholera reported June 27, 1893. (*f*) Total deaths during epidemic 473. (*g*) Cholera reported October 5, 1893. (*h*) Cholera reported September 13, 1893. (*i*) Small-pox reported November 9, 1893. (*j*) Six cases six miles from Lewes, Del., in October.

SMALL-POX IN 1893.—Continued.

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
UNITED STATES:												
New York State . .	15	23	29	23	21	10	16	11	23	19	27	
New York City . .	3	7	10	7	6	8	3	2	20	10	6	14
Philadelphia, Pa. . .						1	3					
Pittsburgh, Pa. (a) .												
Reading, Pa. (b) . .												
San Francisco, Cal. .	1				2							
FOREIGN:												
<i>Arabia.</i>												
Aden								1				
<i>Argentine Republic.</i>												
Buenos Ayres . . .				2			6					
<i>Australia (c).</i>												
<i>Austria.</i>												
Budapest					2							
Trieste	11	8	3	19	18	19	17	11	30	17	9	8
Vienna	1	1	11	4	6	2					3	3
<i>Belgium.</i>												
Antwerp (d)	45	74	55	53	40	41	14	2	5	1	2	2
Brussels	1	6	1	5	1	1	1		1	1		
Ghent				1								
Liège					6	2	5	1	1	2		
<i>Brazil.</i>												
Pernambuco	1						4	1		1		
Rio de Janeiro . . .						1			1	2	10	5
Santos		28										
<i>Canary Islands.</i>												
Teneriffe							1					
<i>Central America.</i>												
San Salvador						7	20	13	6	3		
<i>China.</i>												
Hong Kong	2	6	14	17	2	5		1				
<i>Cuba.</i>												
Havana										1	1	7
Sagua la Grande . .									3			
Santiago de Cuba . .								2				
<i>Ecuador.</i>												
Guayaquil								1	9	28	51	
<i>Egypt.</i>												
Alexandria	2	2	5	2	5	10	5	2	1			
Cairo	1	2	4									1
	2		1	2	3	10	5	2	1			
<i>England.</i>												
Birmingham					5	6	2	1	5	6	16	17
Bradford							4	8	15	27	21	10
Bristol						1				1	9	3
Huddersfield					1							

SMALL-POX IN 1893.—*Continued.*

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
FOREIGN :												
<i>England.</i>												
Hull						2						
Leeds							1	1	2	1	1	3
Liverpool	1	3	2		1			1		1		1
London	5	16	13	26	46	46	22	11	7	5	5	6
Manchester					4	6	3	1				
Newcastle-upon- Tyne (c)					1							
Sheffield						1						
Southampton			1	3								
Sunderland	1	1	1	1			2					
<i>France.</i>												
Bordeaux					4				9		4	1
Brest					1							
Cognac								10	7	5	1	2
Havre					1		1					
Lille						3		1	1			
Marseilles	3				15	13		1	5	4		
Nantes						1					1	
Paris	6	3	5	9	12	18	38	10	38	24	33	40
Rheims				1								
Roubaix							1				2	
St. Etienne					1							2
Trieste											4	
<i>Germany.</i>												
Berlin								1				
Frankfort-on-the- Main					1	3	1					
Hamburg				2	1							
Prague	9	8	6	5	15	7	12		1		1	3
<i>Gibraltar.</i>				1								1
<i>Holland.</i>												
Amsterdam								7				
Rotterdam	1						4	8	18	18	16	49
<i>Honduras.</i>												
Tegucigalpa					5	12						
<i>India.</i>												
Calcutta	2		3	6	3	3	2	4	2	1	19	1
Madras									1	1	1	
Singapore	1	4	13	6	3		9	8		2		
<i>Italy.</i>												
Genoa	1	1				4						
Leghorn											1	
Milan	3		1	2								
Rome					1		1					
Trapani					5						5	
Venice	25	20	6	3	1		2		1			1

(a) Small-pox reported November 21, 1893. (b) Small-pox reported. To November 22, 1893, 642 cases, with 17 deaths. (c) Epidemic of variola reported in W. Australia, April 24, 1893. (d) Epidemic reported April 11, 1893. (e) Epidemic reported May 27, 1893.

SMALL-POX IN 1893.—*Concluded.*

COUNTRIES AND CITIES WHERE PRESENT.	DEATHS.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
FOREIGN :												
<i>Japan.</i>												
Hiogo (a)	380	213	78	29	8			1				
Nagasaki						7	20	6	1		8	3
Osaka						4	1	1	6	1		
<i>Malta and Gozo.</i>							1					
<i>Mexico.</i>												
Mapimi (b)												1
Piedras Negras												1
San Juan del Norte									1			1
Vera Cruz											3	4
<i>Nicaragua.</i>												
Greytown (c)												
Managua (d)												
<i>Peru.</i>												
Callao											1	
<i>Russia.</i>												
Moscow				8	5	9		2		2		8
Odessa	10	28	12	15	2	10	5	2		1	1	1
Riga	80	81	69	71	63	89	12	4	6			
St. Petersburg				4	15	9	4	1	6	5	2	
Warsaw	52	37	25	21	55	54	51	29	77	76	51	12
<i>Scotland.</i>												
Edinburgh							1					
Glasgow (e)	3	9	6	3	2	1						
Leith											1	7
<i>Spain.</i>												
Almeria							3					
Barcelona								18	30			
Cartagena						1						
Jeze de la Frontera	1	1			2							
Lisbon				1								
Madrid					2	9	18	21	27	32	38	30
Malaga					25	20	18	22	20	37		
Marbella								1				
<i>Sweden.</i>												
Gothenberg (f)					3		3				6	7
<i>Switzerland.</i>												
Lucerne		1		1	2			2				
Zurich		1						2				
<i>Turkey.</i>												
Constantinople	14		7	7	9	9	2			14		
<i>Turkey in Asia.</i>												
Bagdad							1		1			
<i>Uruguay.</i>												
Montevideo							1					

(a) Epidemic reported January 21, 1893. Number of cases from beginning of epidemic to January 19th, 1907. (b) Small-pox reported July 15, 1893. (c) Small-pox reported September 12. (d) Epidemic reported July 10, 1893. (e) Epidemic reported January 11, 1893. (f) Epidemic reported April 9, 1893.

ANATOMY.

By PAUL POIRIER, M.D.,

PARIS.

DIGESTIVE SYSTEM.

Rogie, of Lille,²²⁰_{July 21, p.241} has continued the researches begun by Ribbert upon the anatomy of the ileo-cæcal appendix, which, in his opinion, is an organ in a state of regression. This regression is evidenced in three ways, more marked as the age of the subject increases: 1. By a diminution in length. 2. By modifications in the histological structure of the walls. 3. By a tendency to typical spontaneous obliteration of the lumen. The histological changes begin, ordinarily, at the age of 30 years, involving the closed follicles and the mucous membrane. The follicles, at first confluent, separate from one another, and diminish in number about one-half. The mucous membrane becomes diminished in thickness, sometimes being only half the normal. By the process of involution a typical obliteration, always peripheral, is brought about.

Rogie²²⁰_{July 21} presented to the Société Anatomique-Clinique of Lille a *résumé* of Henke's work upon the topography of the abdominal viscera. This author divides the abdominal cavity into four spaces, bounded by three straits,—a superior, a right inferior, and a left inferior. The superior strait corresponds to a plane passing on the level of the belt-line,—the twelfth rib,—slightly above the umbilicus. With the vault of the diaphragm it forms the boundary of the superior or subdiaphragmatic space.

The inferior straits are formed by the psoas muscles, and divide the entire portion of the abdomen situated below the superior strait into three parts,—a middle, occupying the space between the two psoas muscles, the inferior space; two lateral spaces, situated beyond the psoas, right and left.

Other methods of delimitation of the abdomen have been proposed, among them one by Anderson⁹⁹_{July 6, '92} and one by Henry (G-1)

Gerrish. ⁹⁹_{July 6, '92} Henry Gray ⁵⁹_{Dec. 17, '92} touches upon a hitherto neglected point of anatomy, in showing that the sphincter of O'Beirne arrests the passage of fæcal matter, and that it contains muscular fibres possessing a true sphincter action.

Pilliet, of Paris, has published a memoir on the evolution of the liver. His work is a summary of the recent ideas upon the anatomy and histology, normal and pathological, of this organ.

NERVOUS SYSTEM.

Jaboulay and Villard ²¹¹_{Nov. 13, '92} advance a new hypothesis as to the anatomy of the posterior dental nerves (posterior dental plexus and ganglion). These nerves sometimes descend in such a way as to coalesce and form a plexus or several plexuses, and sometimes show a true nervous ganglion attached to them. From the formation of chiasma and the presence of nervous ganglia these posterior dental nerves seem properly to belong to the great sympathetic system, thus permitting, perhaps, the theory that they are a prolongation of vegetative fibres from the superior maxillary nerve.

The sinuses and veins of the walls of the rachidian canal have been studied by Nolard, ⁹⁴_{July} and apropos of his work Dauriac reaches the following conclusions: The apparatus of the intrarachidian venous circulation consists of two longitudinal sinuses, with (1) secondary canals consisting, outside and posteriorly, of anastomosing arches (at the neck of the vertebral sinus) and the posterior plexus, inside of canals supplying the vertebral bodies; (2) communicating canals, the veins of the intervertebral foramina. The classical picture of four large trunks interlaced by a beautiful venous girdle would thus seem to be incorrect.

Edgar Fawcett ²⁷⁷_{Jan.} presents a study of the relations of the dura mater surrounding the inferior maxillary as far as the temporo-maxillary articulation. The dura mater may be seen through the foramen ovale, and upon its leaving the canal it is divided into three parts, which may be distinguished from each other by their respective anterior, external, and posterior relations. The anterior band contains the buccal and external pterygoid branches of the inferior maxillary nerve. The external band terminates in front of the capsular ligament of the temporo-maxillary articulation. The posterior band is disposed on the internal side of the condyle,

where it joins the capsular ligament of the temporo-maxillary articulation. One might suppose, in seeing these two little bands fixed upon the articular capsule, that they took some part in the movements of articulation.

Attention should be called to the article of Robert Munro²_{Sept. 16} upon the conditions of development of the human body. This author believes that the standing posture exercises a great influence upon the development of the organism, and particularly upon that of the brain.

Bellini,⁹⁹⁶_{Apr. 25} in a study upon the innervation of the fingers, shows that the collateral palmar nerves give out several branches, which are distributed upon the dorsal surface of the first phalanx. The dorsal, radial, and cubital nerves, in their turn, give out other branches, which descend toward the palmar surface and there anastomose with the collateral palmar nerves. As regards the second and third phalanges, Bellini accepts the old theory that the collateral dorsal nerves of these fingers are not at all supplied by the radial and cubital dorsal nerves, nor (a recent view) by the median and cubital palmar, but by branches arising from anastomosis of one with the other. In other words, a branch of the radial and cubital toward the middle of the second phalanx anastomoses with another branch of the corresponding collateral nerve, and from this anastomosis arises the dorsal branch of the last phalanges.

From Bellini's article it is to be concluded that there are no true nerves exclusively reserved for the dorsal and palmar surfaces of the fingers. All their surfaces—dorsal, palmar, and lateral—are innervated at the same time by the branches supplying the fingers; that is to say, the index, medius, and external half of the ring fingers are innervated at the same time by two nerves, the radial and the cubital. As to the internal half of the ring finger, it receives its branches from the dorsal cubital and palmar cubital, joined by anastomosing branches.

Bechterew⁹⁹⁶_{May 25} calls attention to the studies of his pupil, J. Meyer, showing the possibility of a new cortical localization. This writer has found that there are joints in the cerebral cortex excitation of which produces contraction of the sphincters. The cortical centre acting upon the anal sphincter is slightly behind the crucial sulcus, on the external posterior portion of the sigmoid

gyrus. That acting upon the vesical sphincter is in the external region of the posterior segment of the sigmoid gyrus, immediately behind the outer extremity of the crucial sulcus.

Van Gehuchten ⁸⁶⁸_{Aug. 25} continues his series of researches on the cell in general, and the elements of the nervous system in particular. According to him, the posterior roots of the spinal nerves contain, at least in the chicken, nervous fibres originating in the cells of the gray substance of the anterior horns of the cord. These nervous elements of the posterior roots, of medullary origin, are identical with the nervous elements of the posterior roots. As with these, the axis-cylinder prolongations, gifted with cellulifigal conductivity, possess at the same time centrifugal conductivity. The author regards them as motor elements, agreeing in this respect with Ramón y Cajal and von Lenhossék.

The existence of pain in pericarditis has led Pianese ⁹⁹⁶_{Apr. 10} to study the nerves of the pericardium, their plexuses and terminations. He has found that in mammals filaments from the left recurrent, phrenic, and sympathetic penetrate into the pericardium,—the first at its apex, especially on the posterior surface; the second at the apex, principally on the lateral surface; and the third following the course of the vessels. These various filaments extend from the apex to the base, subdividing in twos, and forming a network which becomes closer and closer as it descends. The terminations of the nerves vary. Sometimes the filament, deprived of its myelin, takes its course alone and terminates in a free extremity; sometimes, reduced to axis-cylinder, it thins out to a point; or it swells into a round or oval bud, terminating by bead-like granulations. These different terminations are always free, and without an enveloping membrane. The author describes some special terminations, as, for instance, where the axis-cylinder is separated into elementary fibrils, which spread out, fan-like, and swell into buds. This dissociation sometimes occurs in the continuity of the axis-cylinder, which afterward reforms. The simplest termination may be compared to that described by Ciacio as occurring in the conjunctiva. There are also terminations similar to the motor plaques of the muscles, and here and there some similar to the eminences of Doyère. These special terminations are met with principally upon the anterior surface. The plexuses and the terminations are usually seated deeply in the pericardium.

This richness in nervous filaments of the pericardium confirms the existence of central pains, admitted by Peter. The predominating situation on the anterior surface of the pericardium—of the nervous extremities—explains the localization of this central pain; while their deep insertion explains why pain is absent in serous pericarditis, and present in the purulent, tuberculous, and adhesive forms.

J. N. Langley ^{2081 1006}_{v.70,p.320; Dec.} gives a preliminary account of the sympathetic nervous system, based chiefly on observations upon pilo-motor nerves, using the cat as a subject. The spinal nerves containing pilo-motor nerve-fibres in their roots are usually the fourth thoracic to the third lumbar, inclusive. The spinal pilo-motor fibres run into the sympathetic trunk; there they become connected with nerve-cells; on leaving the sympathetic chain they run to their peripheral endings. In the body they accompany those dorsal cutaneous branches of the spinal nerves which supply the skin near the vertebræ. In general, the fibres issuing from any ganglion are connected with nerve-cells in that ganglion and with no other sympathetic nerve-cell. Each ganglion supplies in any individual a definite area of skin. The areas supplied by the ganglia from above downward are successive, with some overlapping.

The author thinks it probable that the fibres of the gray ramus of a nerve (viz., the post-ganglionic sympathetic fibres of a spinal nerve) have, in the main, the same distribution as the sensory fibres of the nerve. He finds less overlapping than Sherrington did in the sensory fibres.

The lumbar nerves in the ape and in man have been studied by Anton Utschneider. ^{2170 1006}_{B.7,H.1; Dec.} The most remarkable result of the comparison was that in man the last lumbar nerve is at least partially included in the plexus, while in apes it is wholly combined with the sacral plexus. The author remarks that the plexus exhibits, in origin, course, and anastomoses, almost a complete identity between man and the apes.

Wilhelm Höfer ^{2170 1006}_{B.7,H.3; Dec.} gives a very detailed and apparently precise account of the distribution of the nerves and Paccinian corpuscles of the arm and hand in man and apes. The three nerves of the flexor aspects of the upper extremity—the medianus, musculo-cutaneus, and ulnaris—are related and have been

separated from each other in the course of philogenetic development. The resulting variability renders them unreliable in determining the homologies of the muscles they may supply. The radialis, supplying the dorsal aspect, is relatively constant in apes as in man. The principal variations are in the sensible branch to the back of the hand, which has a larger area of distribution in apes. In general, deep and permanent distinctions in these respects do not exist between man and the apes, but the differences are frequently such as appear occasionally in man as variations.

BONES AND LIGAMENTS.

Grosse ¹²⁶_{July 15} has studied the foramen of Civinini and the crotaphitic-buccinator foramen. There exists in the human skull a ligament extending from the outer wing of the pterygoid apophysis and the crest of the sphenoid. This ligament, the pterygo-spinous, separates the three branches of the trigeminal from the muscles and the Eustachian tube. Above its point of attachment upon the outer wing a half-circle may be seen, the notch of Civinini, through which passes the internal pterygoid muscle. It may become partly or entirely ossified, Civinini's foramen being then formed. In the ape most nearly resembling man this ligament and notch are met with; in inferior apes, on the contrary, a completely ossified foramen is observed. In all other mammals the foramen does not exist; but when the outer wing of the pterygoid apophysis is not completely reduced, an evident notch of Civinini may be seen on its posterior edge.

In man, as in all mammals, the sulcus crotaphiticus is nearly always found upon the inferior surface of the large wing of the sphenoid,—a furrow directed forward and outward. This furrow is always covered by a ligamentary arch separating the motor branch of the third branch of the trigeminal from the sensory branch, and which sometimes ossifies in man and the higher apes. In other apes and rodents the ligament is always replaced by an osseous lamella, the furrow then becoming a foramen. Other mammals show a more or less marked furrow.

The existence of symmetrical depressions on the parietal bones has sometimes been noted, but the merit of having insisted on this peculiarity of the skeleton belongs especially to George Humphrey. This author is at a loss to account for the deformity.

It is certainly not due to traumatism or to anterior disease, and it can scarcely be explained by senile alteration. Paget attributes it to osseous atrophy, and Mair to senile osteoporosis. Francis Shepherd²⁷⁷_{July} has observed three cases, and from careful examination of these patients concludes that in them the deformity is clearly congenital and hereditary.

The various points characterizing the development of the temporal bone have been clearly explained by Symington in his classical work on the anatomy of the child. The evolution of the mastoid has, perhaps, been generally somewhat neglected, and Jackson Clarke²⁷⁷_{Apr.} has attempted to fill the void by examining the temporal bones of one hundred and twenty adults. He confirms the opinion of Birmingham as to the position of the lateral sinus. After having trephined a large number of adult cadavers, Jackson Clarke has been led to adopt the method recommended by Birmingham.

James Musgrove²⁷⁷_{Oct., '92} has been occupied in elucidating a point much discussed in anatomy, viz., the existence of articular synovia at the level of the costo-sternal articulations. The author invariably found that the cartilage of the first rib united directly with the sternum, without any intervening articular cavity. He found in 11 cases, on the level of the second costal cartilage on the right side, two synovial cavities separated from each other by a narrow band of fibro-cartilage. On the level of the third cartilage, to the right, he found a synovial cavity in 12 cases and two cavities in 5 cases. Only in one case was the cavity absent. On the left side, and on the same level, one cavity was found in 10 instances and two cavities in 7. In one case the cartilage was joined directly with the sternum. On the level of the fourth cartilage there was always observed one or two cavities on the right side; on the left, absence of the synovial cavity was observed 3 times. On the level of the fifth cartilage there was a predominance on each side of a simple articular cavity. At the sixth there was either a single cavity or none at all. At the seventh the tendency to absence of diarthrodial articulation was still more pronounced.

Carwardéne²⁷⁷_{Jan.} offers the following conclusions from a study of the supra-sternal bones: 1. The supra-sternal bones occur as ossifications in ligaments which are almost constantly present in the adult, though to a variable extent. 2. The supra-sternal bones

may fuse with the sternum at an early period, being represented by tubercles, with the ligament attached to them. 3. In other cases the supra-sternal bones are incorporated with the sternum, leaving the ligaments attached to the sites of incorporation.

Among other interesting contributions upon the bones and ligaments, two papers by Alexander Macalister,^{277 Jan.} upon the acromion and the first costo-vertebral articulation, are worthy of special note.

GENITO-URINARY SYSTEM.

There is very little of interest to be gleaned from the literature of this subject. Among the more important is an article by J. Raynal^{1088 Jan. 22} upon the asymmetry of the kidneys, as regards weight, form, and position. The two kidneys are rarely alike. Ordinarily the left is narrower, but thicker and longer; it is generally heavier, weighing from 5 to 10 grammes ($1\frac{1}{4}$ to $2\frac{1}{2}$ drachms) more, and in certain cases 20 to 30 grammes ($\frac{2}{3}$ to 1 ounce) more. It is commonly believed that the right kidney is altogether lower than the left; the difference, however, is scarcely noticeable, and sometimes even the right kidney is higher than the left.

Von Zeissl^{36 Mar.} has studied experimentally the innervation of the bladder, and formulates the following conclusions: 1. The sacral (erector) nerve regulates the muscular movements and opens the sphincter. 2. The sphincter may be opened independently of muscular contraction. 3. The hypogastric nerves preside over the closing of the vesical orifice, but have little action upon the contractility. 4. The hypogastric nerves arrest spontaneous movements of the bladder-muscle. 5. The two nervous groups appear to obey the law of crossed innervation formulated by von Bach.

F. Allen^{277 Jan.} has contributed a paper upon the functions of the urethral bulb.

ANOMALIES AND MONSTROSITIES.

By W. XAVIER SUDDUTH, A.M., M.D.,

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ASSISTED BY

ERNEST BREWSTER SANGREE, A.M., M.D.,

PHILADELPHIA.

Kenneth Cameron²⁸²_{June} reports a case of occipital meningocele. On the back of the child's neck was a large, irregular, slightly lobulated, sessile swelling, measuring eight inches and three-quarters in circumference, three inches and one-quarter horizontally, and four inches and one-half longitudinally. In addition there was fissure of the hard and the soft palates. The child lived several days, without cerebral symptoms. Cameron does not give the exact cause of death.

J. H. Croon³⁶_{Mar.} describes an interesting case of acephalic, acardiac fœtus, consisting of an oval trunk to the narrow end of which was attached a rudimentary, distorted, lower right extremity. On dissection no viscera were found, except a blind piece of intestine, the abdominal cavity being filled with loose fibrous tissue.

McArdle²⁰³³_{Nov. 25, '92} relates a case of intra-uterine arrest of development, occurring, probably, as a result of injuries sustained by the mother in a railroad accident when she was three months pregnant. At birth the spinal canal, with the exception of the middle dorsal region, was exactly in the condition found in a three months' fœtus.

Turner²⁷⁷_{Apr.} reports a case in which the phrenic nerve received a root of origin from the descendens hypoglossi.

Bocianski⁷⁸³_{June} describes a case of gastrodidymus bimasculinus, a monstrosity hitherto unobserved. A woman in her eleventh confinement gave birth to a monster having two heads. The vertebral column was double as far as the last thoracic vertebra, where it united with the dorsal vertebræ to form a Y. There were four
(H-1)

superior extremities, four shoulder-blades and collar-bones, and two sternebrae. The right and left halves of each embryo were well developed, the bodies forming one common cavity containing the lungs, which were divided into five lobes, and one heart common to both bodies. There was one bladder, from which two urethrae sprung, each having a penis—one, with testicles, being placed near the symphysis pubis, the other being situated at the anal orifice. The sexual organs were quite developed. There were but two lower extremities. (Report of Corr. Editor Drzewiecki, Warsaw.)

W. B. Dewees ¹¹²_{July} reports a case of anencephalus which he attributes to maternal impression. The mother when five months pregnant saw the body of a man the top of whose head had been cut off in a railway accident. E. T. Shelley ¹_{Apr. 1} relates a case of anencephalus. The foetus was born at seven months; the brain was represented by a dark mass on the child's neck and back, and the spinal canal was open for some distance down the back. O. M. Blood ¹⁹²_{June} also describes what was probably a case of anencephalus. Other instances are reported by Guinard, ²¹¹_{July 23} McLaren, ¹⁰⁵_{Jan. 15} Brodie, ²¹³_{Mar.} and Torkomian. ³¹_{July 29} Cassoute ⁴⁶_{Mar. 15} reports a case of anencephalus, one of exencephalus, and also one of pseudencephalus. A case of pseudencephalus is described by M. Villard. ²¹¹_{Feb. 12} Ausset ¹⁵²_{Sept. 30, '92} and Briz ⁸⁹_{Sept. 20, '92} each describes an instance of cephalhæmatoma.

B. C. Hirst ¹¹²_{Nov., '92} gives several excellent illustrations and a brief description of a case of syncephalus and one of otocephalus. The first—an example of janiceps asymmetros—is a not very uncommon form of monster. The second, however, is rare in the human race, though not infrequent in sheep. Another case of syncephalus is given by Scrutator. ⁶⁴_{Jan.} This monster was Chinese, and presented two well-formed faces, one looking either way; an instance of janiceps symmetros.

Millon ¹⁹⁴_{Dec. 7, '92} describes a case of otocephalus. J. Ballantyne ³⁶_{Mar.} gives a most complete description of a case of foetus paracephalus dipus acardiacus, with details of similar specimens already recorded, and a thoughtful inquiry into the probable etiology of such phenomena. N. T. Miller ³⁶⁶_{May} reports a case of craniopagus parasiticus. The monster lived fourteen hours, cried several times, and urinated once.

Face.—J. R. Folsom ⁸²_{Jan. 2} observed an instance of cyclopia in a

female colored infant, living at birth, but dying a few minutes after. The single eye was situated in the centre of the forehead; the brow being a complete arch, as was also the upper eyelid. Midway in the lower lid was a mark indicating an effort at division. The nasal bones were absent, and the soft parts dropped down into the mouth in lieu of an upper lip. The child was otherwise perfect.

Geo. McCoy⁵⁶_{July} reports a very singular malformation of the nose in a newborn child. The right side was completely separated from the left by a space one inch wide; the left side was normal, but the right consisted of a semicartilaginous tube, well supplied with erectile tissue, attached to the face immediately over and to the inner side of the right eye. So singular was the shape that the nurse mistook it for a supernumerary penis. The abnormal growth was afterward removed, greatly to the benefit of vision in the right eye. The tube was found to connect with a blind pouch partly within the superciliary ridge. No malformation of the bones was apparent.

J. Kaufman⁵⁹_{Nov. 19, '92} records an instance in which a 17-year-old primipara gave birth, at the seventh month, to a male child having a full set of upper and lower teeth. E. Thomas²³⁹_{Jan. 1} gives an instance of congenital absence of both eyeballs, observed in a Hindu child of 8 months. There were well-developed eyelids and lashes, but no vestige of eyeball in the orbital cavities.

Thorax.—W. E. Sleet²²⁴_{Sept. 24, '92} reports a case of supernumerary breasts in a woman of 37 years. Besides ordinary well-developed breasts, she had one in either axilla, each about the size of a goose-egg. These breasts were developed during her fifth gestation. They gave exit to a milky fluid on each subsequent occasion, until the secretion was dried up by proper remedies.

S. Schroeder⁷⁸⁶_{Dec., '92} notes three instances of supernumerary mammæ:—

1. A woman of 50 years had on either side, four inches below the normal mammæ, a well-marked nipple and areola, but the breast was only slightly developed.

2. A German man of 54 years had three well-marked nipples in the right mammary line and two in the left.

3. Also a German male, aged 46, with two nipples and areolæ in each mammary line.

Instances of supernumerary breasts are also reported by Bué²³⁶_{June} and Hart.²_{Nov. 12, '92}

The Orissa twin sisters, ²_{June 3} now going the rounds of the museums, are a double monstrosity of the thoracopagus type. They are healthy children, 4 years old, apparently perfect in every respect, except that from the ensiform cartilage to the umbilicus they are united. The link is four inches long and two wide. The children when facing can draw their chests three or four inches apart, the band being so flexible that each can sit on either side of the body. It is not known whether the connecting-band contains viscera.

Heart and Vessels.—Struthers³⁶_{July} exhibited a series of specimens of patent foramen ovale. The first was that of a female dying at 58 years of age. The opening was large enough to admit three fingers. The second was from a female who died at the age of 60, the opening being three-eighths inch in diameter. The third specimen, also from a female, dead at the age of 70 years, had an opening of about the same size. The fourth was from an adult subject, with an opening large enough to admit a goose-quill. At the meeting of the Anatomical Society of Great Britain and Ireland Sir William Turner showed a human heart with moderator bands in the left ventricle; S. Boyd,²⁷⁷_{Apr.} a case of left superior cava without transposition of viscera.

Burgess⁹_{Apr. 22} reports a case of prenatal closure of the pulmonary artery. The child lived one hour. The occlusion was musculo-membranous in character. D. E. Jacobson⁷⁷_{Mar.} describes a case of congenital telangiectasis and crossed multiple hypertrophy. The patient was a girl of 3 years of age, the illegitimate offspring of young, healthy, and well-formed parents. There are only two other cases on record of crossed hypertrophy. Owing to the extent of the process in this case, the author regards it as a most remarkable pathological specimen.

Abdominal Cavity.—J. M. Hobson²_{Mar. 25} reports a case of congenital obliteration of the duodenum. After death, which took place in three days, the stomach was found to end in a blind pouch at about an inch beyond the pylorus. The intestine began blindly at the entrance of the common bile-duct. W. Melsome²⁷⁷_{Apr.} describes some cases of variation of the sigmoid flexure, and Rolleston,²⁷⁷_{Apr.} anomalies in the lobulation of the liver. J. R. Logan¹⁸⁷_{July} reports a

case of occlusion of the œsophagus in an infant born at the seventh month and living six days. At the post-mortem the pharynx was found to be normal; but at the level of the sixth tracheal ring the œsophagus was abruptly occluded, ending in a fibrous band closely adherent to the trachea, which expanded into normal calibre about two inches above the stomach.

J. B. Elkins⁵⁴⁷_{July} reports a case of diaphragmatic hernia. The child lived an hour. At the autopsy coils of intestine were found in the left pleural cavity. The left lung was collapsed, and in this cavity were found the spleen, pancreas, stomach, and entire intestinal tract, with the exception of a small loop of the duodenum, the descending colon, and the rectum. The liver had fallen downward and occupied almost the entire abdominal cavity. The left side of the diaphragm was deficient, with the exception of a small rim around the anterior region of the thorax.

Joseph Collins⁵⁹_{Apr. 16} reports a case of complete transposition of all the thoracic viscera. The patient, a man of 61, had never suffered any inconvenience from the condition, and finally died of chronic nephritis. Other instances of this anomaly are given by Woodward⁹_{June 8}; Carter²_{July 22} and Toledano⁷_{Nov.} and an interesting article on the causation of the phenomenon is contributed by Carl Mayer.⁴¹_{Dec. 8, '92} Hoffman¹²¹_{Feb.} found a complete occlusion of the intestine twenty-five inches from the pylorus in a child which died on the eleventh day. Cases of imperforate anus are reported by Broca¹¹⁸_{Feb.} and Tissier.¹⁹⁴_{Nov. 10, '92}

G. C. Still²_{Apr.} reports a case of transposition of the viscera in a girl of 14 years. Ira Johnson⁷⁸⁶_{Apr.} discovered a similar condition in a woman who died of uterine cancer at the age of 49 years. Instances of double monster of the thoraco-abdominopagus type are reported by Huber¹³³_{Nov., '92} and of single thoraco-abdominopagus by W. W. Jaggard²⁷_{Jan.} and by Young and Hermon.¹⁰¹_{May} H. K. Plummer⁸⁶_{Dec., '92} describes a case of ischiopagus. G. H. Young²_{June 8} found a supernumerary spleen, one and one-quarter inches in diameter, lying below the normal spleen and attached to it by a distinct fold of peritoneum.

Genito-Urinary Organs.—Geo. Cook⁵⁹_{Nov. 19, '92} reports a perfect horseshoe kidney. Each organ had its ureter, artery, and veins. J. Noel⁷_{Oct., '92} observed an instance of ectopy of the left kidney. Meisels¹⁴_{July 26} notes a case of double ureter.

Townsend⁹⁹_{Mar.30} reports several cases of abnormalities of the female genitals. The first case was one of congenital opening of the rectum into the vagina, observed in a woman of 21 years of age. The second case was a girl of 19 years, who came to the hospital to learn why menstruation had not occurred. The breasts were of fair size, and the girl was generally well developed. The external genitals were normal, but the hymen was imperforate and careful examination showed no trace of vagina, uterus, or appendages. The third was a case of pseudo-hermaphroditism observed in a patient of 35 years. On four different occasions a small amount of blood was discharged from the genitals. The patient never enjoyed the society of men and had no sexual desires for either sex; was four feet ten inches high; voice rather deep, and figure generally masculine; nipples small and no mammary glandular tissue; abundant growth of hair on back, arms, and legs. The external genitals consisted of clitoris or penis one and three-eighths inches long in the flaccid state, with well-marked glans. The prepuce was continued into what appeared to be labia minora, but which might be a cleft scrotum devoid of testicles. Below this clitoris or penis was a canal admitting the little finger for a short distance. Here there was a slight constricting ring, but a catheter could be passed up to a small uterus. No ovaries or testicles could be found. The urethra opened somewhere in the course of the canal. In spite of female attire and female work, the author thinks his patient is probably of the male sex.

John Lindsay²¹³_{Mar.} describes three cases of malformation of the external genital organs occurring in one family, and showed one of the children. He was of opinion that all were hypospadiac males with undescended testicles, although two of them had been brought up as girls. The parents and six other children of the marriage were naturally formed. H. Fehling¹⁵⁴_{July 1} and Guinard²¹¹_{Jan. 1} each report a case of pseudo-hermaphroditism, while Messner¹³_{Aug. 15} gives an instance of what is apparently true one-sided hermaphroditism. Henri Azema⁴⁸_{Mar.} mentions an interesting case of absence of vagina. The uterus was present, but there was a large accumulation of menstrual fluid owing to there being no outlet. An artificial vagina was successfully made. Windle²⁷⁷_{Apr.} cites an example of elongated and bifid clitoris. Mirabella⁵⁸⁹_{Apr. 29} notes a case of double uterus and vagina. Ribbert²¹⁴_{May 15} and R. C. Hill⁸²_{Apr. 22} report cases of pseudo-

hermaphroditismus masculinus internus. W. B. Platt⁷⁶⁴_{May} describes a case of complete epispadias. Nijegorodzeff¹⁶⁴_{May 25} reports a case of congenital absence of the testicles in an adult.

Extremities.—Cotterill³⁶_{June} showed a girl of 11 with a congenital deformity of both forearms, consisting of an inability to supinate. Both radius and ulna were present, but small, and there was evident atrophy of some of the carpal bones. Felix Opfer⁶⁹_{Dec. 1, '92} reports a case of complete congenital absence of both arms, and Pringle²⁷⁷_{Jan.} a case of congenital absence of both ulnæ. Ballantyne³⁶_{Jan.} exhibited a child with a curious bifid hand. There were seven digitis in two groups of four on the radial side and three on the ulnar side, with an interdigital groove between. H. D. Pant²³⁹_{May 1} noted an absence of the upper extremities in a child of 3 years of age, due to intra-uterine amputation. As a compensation, this child could use his feet with as much ease as others do their hands. Albers⁴_{Mar. 6} gives an instance of polydactylism.

G. S. Mill⁶_{Oct. 1, '92} mentions a woman four out of six of whose children were marked by supernumerary digits. H. E. Brockman²⁶_{Nov., '92} relates an instance of polydactylism remarkable owing to the fact that this condition had presented itself in many members of the same family. Milligan³⁶_{July} describes an abnormality of the nails which supports the views expressed by Unna as to nail-growths. The nails appear to grow directly from the dorsum of the finger, the nail-fold which covers and protects the nail-plate behind the lunula being absent. F. W. Ross²_{June 3} mentions a case in which a growth attached to the little finger was attributed to maternal impression. The mother had a desire for apples during her pregnancy, and the growth strongly resembled an apple. It was doubtless a supernumerary digit. Hutchinson⁸⁰⁶_{Apr.} mentions defects in the ulnar digits which had run through three generations; a case of congenital bilateral defect consisting in the arrest of development of the ulnar digits; also a case of superfluous thumb on one hand, with a history of the same deformity on the same hand in three generations; and, lastly, a case of congenital absence of the ulna and its digits. R. A. Lundie³⁶_{May} details a case of hydrocephalus where there was no thumb on the right hand and no radius in the right arm. Joseph Coats²¹³_{June} showed a specimen of so-called siren malformation of the lower limbs known as

sympus. G. E. Shoemaker⁴⁵¹_{Mar.} and H. D. Pant²³⁹_{May 1} report cases of complete absence of the lower extremities.

PHYSIOLOGY.

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AND

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BALTIMORE.

BLOOD.

Blood-platelets.—Mosen¹⁸²_{p.382} finds that these unstable elements of the blood can be obtained in considerable quantity by centrifugalizing oxalated blood (containing 0.2-per-cent. ammonium oxalate) for a period of from two to seven hours. They are found as a delicate, whitish layer on the surface of the whole mass of solid particles thrown down in the process, and may be taken off with a fine pipette for subsequent microscopic examination. It is important to note that the platelets are remarkably stable in the plasma deprived of its calcium by means of the oxalate, retaining their normal structure one and a half to two days at the ordinary temperature. Combining the use of strong immersion lenses and various staining and other microchemical reagents, the author not only satisfies himself that he is dealing with the same structures as those described by Hayem and Bizzozero, but is enabled also to add some new facts which he sums up under the following heads: (a) Their size varies (in rabbits and dogs) from 0.5 to 5.5 μ . (b) They consist of a more highly-refracting, deeply-staining, nuclein-like substance, in the form of a single spherical mass or of a number of small granules, contained within a paler protoplasmatic body. (c) Their form is spherical or elliptical, but generally a variable number of processes radiate in all directions from the central mass. These processes consist of the pale protoplasmic material, are very long, and frequently branch. Two or more platelets may be joined by means of these delicate threads. The author is inclined to believe that the processes are present even in the circulating blood, and points out that their absence in preparations (I-1)

made in the usual way, with osmic acid or methyl-violet, is the result of the action of these reagents. In specimens obtained from his oxalated blood, in which the processes are fully developed, they disappear rapidly on the addition of osmic acid, and the ordinary circular discs remain. Corroborative evidence of their connection with coagulation is furnished by experiments, in which Mosen compares the amounts of fibrin obtained from equal quantities of plasma, differing only in the presence or absence of blood-platelets. Addition of the platelets increases the fibrin 20 per cent. or more in every case. The part which they play in these cases is inferred from a comparison of the insignificant weight of the platelets with the increase of fibrin obtained; they probably furnish only nucleo-albumen, the antecedent of fibrin ferment, and this accounts for the greater rapidity of the clotting process observed in the specimens containing the platelets.

Coagulation.—The subject of the coagulation of blood seems to be undergoing a complete revision, owing mainly to a more-thorough study of the proteids of blood-plasma. At least three important contributions to the subject have been made during the past year. Pekelharing^{2078 69}_{192; No. 50, 192} publishes a monograph containing his latest views. Briefly stated, he believes that fibrin is a calcium compound of fibrinogen, and that the calcium is derived from the fibrin ferment, which he describes as a compound of calcium with a nucleo-albumen. Fibrin ferment is formed mainly after the shedding of blood, the nucleo-albumen constituent coming from the formed elements of the blood (plates, leucocytes, and red corpuscles), and the calcium, presumably, from the inorganic salts of the plasma. He speaks of the nucleo-albumen as zymogen, and zymogen plus calcium makes the ferment. The nucleo-albumen may be isolated in various ways, most readily by first oxalating blood, collecting the plasma, removing the fibrinogen by NaCl, dialyzing for some time, though not long enough to precipitate the globulins, and then adding acetic acid to a feeble acid reaction. Pure nucleo-albumen thus prepared gives no clot when added to pure fibrinogen solutions, but if Ca is present a clot will form. Nucleo-albumen prepared by his method shows the following reactions: When digested with pepsin and HCl a precipitate (nuclein) forms, which is insoluble in water, but soluble in alkalis. Its solutions coagulate at 65° C. (149° F.). When dissolved in normal saline and cooled

a deposit of amorphous, spheroidal masses is formed, which seems to be identical with the α -fibrinogen of Wooldridge, obtained from peptone-plasma by cooling. He uses his theory to explain certain well-known facts with regard to blood-clotting. Albumoses injected into the circulation prevent clotting because they bind the Ca, and thus prevent the formation of ferment. Extracts of leech-heads, on the contrary, hinder clotting by preserving the corpuscles from disintegration, and thus preventing the formation of nucleo-albumen. In support of this view, he makes the assertion that plasma prevented from clotting by leech-extracts may be made to clot by adding solutions of nucleo-albumen, while addition of Ca alone is without effect. Fluoride of calcium added to the blood prevents clotting partly by precipitating the Ca and partly by preventing the formation of nucleo-albumen. The cell-globulin β , formerly described by Halliburton as constituting fibrin ferment, Pekelharing demonstrates to be identical with his nucleo-albumen. The compound of this latter substance with Ca, which constitutes the ferment, seems to be a firm one, since the addition of oxalates, which will throw down the Ca from its inorganic combinations, does not remove the Ca from ferment. Pekelharing believes that other nucleo-albumens, differing in some respects from that obtained from the blood-corpuscles, may unite with Ca to form a compound capable of coagulating fibrinogen. For example, casein may act in this way, and likewise the substances obtained from thymus and testicle, and designated by Wooldridge as tissue fibrinogens. This latter group of bodies is believed by Pekelharing to be composed of a number of nucleo-albumens, and upon his theory of the properties of the nucleo-albumens he explains some of the phenomena described by Wooldridge and others. Thus Wooldridge discovered that tissue fibrinogens injected into rabbits may cause intra-vascular clotting. Pekelharing finds that the same result may be obtained from nucleo-albumen of the blood prepared by his method.

In other cases injection of nucleo-albumen solutions may retard coagulation instead of hastening it, and this is especially true of dogs. This effect is what Wooldridge has designated as the negative phase of the action of the tissue fibrinogens. Pekelharing explains it in this way: Solutions of nucleo-albumen, when alkaline, decompose readily with the formation of albumoses. In

the alkaline blood this reaction may take place, and the albumoses formed will prevent coagulation. The negative phase is best obtained from dogs in which artificial respiration is used to remove the excess of CO_2 , and in such case he has been able to demonstrate the presence of albumoses in the blood. Rabbits' blood outside of the body, when mixed with thymus leucocytes which have been washed previously to remove the nucleo-albumen already formed, will soon clot, the explanation being that fresh nucleo-albumen is formed.

If the same washed leucocytes are injected into the living rabbit, and even if the injection is repeatedly made, no intravascular clotting will occur. This result, taken with the fact that in dogs, especially when under artificial respiration, injection of nucleo-albumens does not usually produce clotting, leads Pekelharing to suppose that the body possesses some means of destroying nucleo-albumens within certain limits. He suggests that the endothelial cells may possess this function, forming a safety mechanism capable of protecting the blood not only from the small normal liberation of nucleo-albumen, but also from much larger amounts artificially injected into the circulation. The method of destruction, he thinks, may consist in the splitting up of the nucleo-albumen with the formation of albumoses, since, in cases of injection of nucleo-albumen solutions in which clotting does not occur, the animal may show albumose coma and evidence of albumoses in the blood.

Halliburton²_{Mar.25} adds some new facts to those observed by Pekelharing, though in the main confirming his observations. He finds that, contrary to the hypothesis of Wooldridge, lecithin plays no part in the changes of coagulation. Lecithin prepared from impure solutions of nucleo-albumen does not cause clotting when injected, while the purified nucleo-albumen does. If the solutions of nucleo-albumen are still further purified by repeated solution in saline and precipitation by water, they lose their coagulating action, owing to a decomposition of some kind, which Halliburton was not able to explain. The "negative phase" sometimes following injection of leucocytes or nucleo-albumens into the circulation of a living animal, and which is explained by Wright and Pekelharing as due to the formation of albumoses from the decomposition of the nucleo-albumen, was investigated also by Halliburton, with

negative results. He was not able, after making such injections, to discover any trace of peptone in the blood or urine.

The most noteworthy contribution to the subject of blood coagulation made within recent years is, without doubt, by Schmidt,²⁰⁷⁹ who gives the final conclusions of a life-long study of blood and its coagulation. It is remarkable for the number of new facts, for the vast amount of experimental work, and for the complicated and unsatisfactory theory or theories to which the author is finally forced by the results of his work. It is not possible to mention the experiments or all the interesting conclusions set down in the book; only the more important and novel results can be stated. He classifies the conditions necessary for coagulation as follows:—

1. Certain soluble proteids (the two globulins of the blood) as the material from which the fibrin is made.

2. A specific ferment as the means for changing these globulins into another proteid soluble in the mother-liquid, and which, in turn, is precipitated by the neutral salts of the plasma as an insoluble modification (fibrin).

3. A certain amount of neutral salts to change the soluble product of fermentation to the insoluble form (fibrin).

With reference to these neutral salts and the part they play, he is not very clear. He does not say what salts he means, beyond the expression “neutral salts.” His idea of the change, then, is, apparently, that the ferment first changes the soluble globulins to a modified proteid, which remains in the plasma as a vastly swollen body, like silicic acid, and that the neutral salts transform this to the body which we call fibrin.

Schmidt's old theory of coagulation, the one still quoted in text-books, was that fibrin was formed by an interaction of fibrinogen and fibrinoplastin (paraglobulin) brought about by the action of fibrin ferment, and that, moreover, the neutral salts of plasma were necessary for the reaction. He still believes in the necessity for the neutral salts, and gives a partial explanation of how they act, as has just been described. He still believes, also, that both the blood-globulins are concerned in the process, but gives a different explanation of the part they take with reference to each other. He now thinks that so-called fibrinogen is merely a modification of paraglobulin, formed during or preceding the act of

coagulation, and suggests for it the new name of "metaglobulin." His idea seems to be that the fibrin ferment itself acts upon the paraglobulin, forming fibrinogen (metaglobulin) first and eventually fibrin. Inasmuch as paraglobulin and fibrin ferment exist together in serum, and yet no fibrinogen is produced, he is obliged to suppose that there is a third unknown factor or condition necessary for the reaction. He still believes, also, in a specific fibrin ferment, and gives some experimental evidence for its existence. For example, he is able to show that a fibrinoplastic solution may be used for at least nine successive coagulations, though he does not believe that the ferment has unlimited possibilities of action. In this connection he quotes with approval the statement of Grätzner, that the so-called "unformed ferments" are destroyed in part by their activity, and are not able to transform unlimited, though considerable, amounts of the substances they act upon. In connection with fibrin ferment, Schmidt describes a new class of bodies under the general name of "zymoplastic substances." His idea is that these bodies are capable of forming ferment by acting upon its mother-substance,—that is, the zymoplastic substances hasten coagulation not because they have themselves any ferment action, but because they are ferment formers. These zymoplastic bodies are found in the alcoholic extracts of various tissues, liver-cells, spleen-cells, leucocytes, muscle, brain, pancreas, red corpuscles, etc., and seem to include such bodies as lecithin, xanthin, hypoxanthin, leucin, glycin, taurin, kreatin, guanin, and uric acid. The action of the zymoplastic substances is not destroyed by boiling, in which point they differ from the ferment itself. He proposes the term "thrombin" as a distinctive name for the fibrin ferment and "prothrombin" for the mother-substance, as yet undiscovered, from which it is formed by the action of the zymoplastic substances. Prothrombin is found in plasma as well as in serum, and is present also in the aqueous solutions of many cells, especially the lymphocytes. The difficulties into which Schmidt's theories lead him may be seen in the explanation he gives of the relation of leucocytes to blood-clotting. In blood-plasma there are present prothrombin, thrombin, zymoplastic substances, the neutral salts, and the globulins; nevertheless, coagulation takes place only upon shedding, and even then seems to be dependent upon the breaking down of a certain number of leucocytes. What relation has this last process

to the act of coagulation? Schmidt is obliged to assume that upon the breaking down of the leucocytes an unknown something is liberated, which starts the train of events culminating in the production of fibrin. After his elaborate analysis of the factors of coagulation, it is disappointing to have the actual liberating force initiating the whole process described as a *tertium quid*. In the course of his work Schmidt gives a valuable account of the constituents of cell-protoplasms with reference to their relation to coagulation. He classifies these constituents into three groups,—those soluble in alcohol, forming his group of zymoplastic bodies; those which, after treatment with alcohol, are soluble in water, to which he gives the name of “cytoglobin”; those which, after previous treatment with alcohol and water, are soluble in dilute salines or alkalis. To what remains after treatment with alcohol, water, and saline he gives the name of “cytin.” From cytoglobin, by the action of acetic acid, he obtains a proteid body, præglobulin, and this, in turn, acts as a mother-substance to paraglobulin. The genetic history of fibrin from the cell to the clot he gives in this order: cytin, cytoglobin, præglobulin, paraglobulin, metaglobulin (fibrinogen), soluble intermediate product, fluid fibrin, fibrin. According to this scheme, fibrin may be derived from any cell in the body except the red corpuscles, the latter being thrown out because they yield no cytoglobin. From this incomplete review it will be seen that Schmidt’s present theory is much more complicated than his old one, and that it lacks the clearness and simplicity of the theories of Pekelharing and others. He seems to have ignored completely the special importance of calcium in the act of coagulation, and one cannot help thinking that some of his difficulties would have been removed if he had taken into account the work of others, outside of his own school. On the other hand, it must be remembered that Schmidt aims to give a deeper history of coagulation than is attempted in the theory of Pekelharing. He endeavors to trace back the fibrin-factors to the cell-protoplasm itself.

Nature of Fibrin.—Arthur⁴¹⁰_{p.392} states that fibrin, as ordinarily prepared, is soluble in dilute saline, and especially in dilute solution of fluoride of sodium. In 1-per-cent. solutions of the latter salt fibrin dissolves slowly at 10° to 15° C. (50° to 59° F.), but rapidly and abundantly at 40° C. (104° F.). It is not, however,

completely dissolved even at the latter temperature. Solutions of fibrin obtained in this way show properties similar to those recognized as characteristic of the globulins; they are precipitated by dilution, by dialysis, and by acids; they are partially precipitated by sodium chloride added to saturation, and completely precipitated by magnesium sulphate; they are coagulable by heat. With reference to this latter property he finds that two precipitates or coagulations occur, one at 56° C. (133° F.) and one at 64° to 75° C. (147° to 167° F.). If the moist, solid fibrin is heated, it can be shown that at 56° C. (133° F.) a portion is rendered insoluble, and the remainder at 75° C. (167° F.). It is not supposed that two distinct proteids are combined in the formation of the fibrin, but that when the temperature is raised to 56° C. (133° F.) a splitting occurs, a portion of the molecule being coagulated and a portion going to form a new globulin, which coagulates only at a higher temperature, the fibrin in this respect resembling fibrinogen solutions, as was described by Hammarsten. With regard to the relative amounts of the two components into which the fibrin molecule splits, Arthus states that the proportion of the proteid coagulating at 56° C. (133° F.) to the total fibrin varies from 0.696 to 0.883.

Lactic Acid in Blood.—Irisawa ¹¹⁴⁶ _{Nos. 310, 311} ⁸³ _{Nov., '92} has made an investigation of the amount of lactic acid in blood and urine, under different conditions; the lactic acid was determined as zinc lactate. The following results were obtained: In the blood of the cadaver lactic acid is always present; reckoned as lactate of zinc, the amounts varied from 0.233 to 6.575 per 1000 parts. In the freshly-shed blood of dogs lactic acid was also found, the amounts varying from 0.380 to 0.540 per 1000 parts. The author believes that in the blood the amount of lactic acid is increased by anæmia or any condition which diminishes the amount of oxygen. In the liver and pancreas crystals of the acid phoshate of potassium KH_2PO_4 can be obtained, and Irisawa is inclined to believe that the post-mortem acidity of these organs (as of muscle) is due to this acid-reacting salt, rather than to free lactic acid.

Chemistry of Blood-plasma.—The interesting fact that the quantity of fibrinogen contained in blood-plasma is regularly found increased twenty-four hours after severe hæmorrhage is established by a series of quantitative analyses made by Dreyer ²¹⁵ _{Mar.} on the salted

plasma of cats. His method consisted in taking from fifty-five to eighty cubic centimetres of blood from the carotid artery one day and bleeding the cat to death on the following. The quantity of fibrinogen in equal quantities of the two bloods was determined by Fredericq's method, and was found to be increased in every case, the increase varying from 11 to 122 per cent.,—on the average, 43 per cent. This fact is interpreted as throwing light on the origin of fibrinogen, which the author believes is derived from the nuclei of erythroblasts which, as Howell showed, are bodily extruded when the erythroblasts develop into red corpuscles, and which seem to go into solution in the plasma after extrusion. The fibrinogen is increased by bleeding because the hæmatopoietic function of the marrow is stimulated by anæmia and so many more nuclei are extruded within a given period than under normal conditions. Corroborative evidence for such an hypothesis is found in some earlier observations of Schmidt and Semmer and in those of Boll, for which no rational explanation has hitherto been offered. Schmidt and Semmer succeeded in obtaining a second clot from the defibrinated blood or red corpuscles of amphibia and birds, while this is not possible with mammalian blood. Since the red corpuscles of the lower vertebrates contain a nucleus, the second clot would be readily accounted for on the supposition that these nuclei furnish fibrinogen when dissolved. Again, Boll found that the blood of chick-embryos, up to the twelfth day of incubation, does not clot, for the reason that it contains no fibrinogen. After that time fibrinogen begins to be present, and gradually increases in amount, the blood at the same time furnishing a denser and denser clot. Dreyer's hypothesis explains this curious fact in this way:—

The first-formed corpuscles of the bird being nucleated, are developed without a simultaneous production of fibrinogen, thus differing from mammalia; fibrinogen, in fact, should not be present until the first generation of corpuscles has lived out its normal period of existence (which in this case would be about ten to twelve days) and begins to break down. The nuclei are then set free and fibrinogen appears, as shown by the clotting of the blood. Analyses were also made on the blood of starving cats, with the idea of throwing light on the origin of the other proteids of the plasma. The results show little or no change in the fibrin-

ogen and serum-albumen after fourteen days' abstinence, while the serum-globulin is regularly diminished, this diminution amounting, on the average, to 42 per cent. The author does not attempt to draw any general conclusions from these observations.

Tension of O and CO₂ in Circulating Arterial Peptone-Blood.

—So long as experimenters agreed in finding the tension of O in the blood below that of the alveolar air, and the tension of the CO₂ of the blood above that of the alveolar air, Pflüger's diffusion theory of the gaseous exchanges in the lungs met with little opposition. In 1891 Chr. Bohr determined the tension of the blood-gases in the arterial peptonized circulating blood of the dog, and obtained results which showed that the O tension is frequently higher and the CO₂ lower than the tension of the corresponding gases of the alveolar air. A secretory function of the pulmonary epithelium is therefore taken for granted, in order to explain the passage of the gases in the direction of higher pressure.

Fredericq ²⁶⁵_{B.7, H.2} points out a possible source of error in Bohr's experiments, in that the latter assumed an equilibrium to have been established between the blood and the mixture of gases in the aërotonometer long before this was actually the case. The almost-perfect agreement between the curves for the initial and final tensions, which Fredericq constructs from Bohr's figures, indicates that this was almost certainly the case. Fredericq, therefore, repeats the experiments, taking special precautions against a similar error; otherwise, the method and details of the experiment agree with those of Bohr. The aërotonometer, which is figured in this preliminary account of the work, is extremely simple, but effective, and the blood circulates through it for an hour in intimate contact with the gas-mixture. His results are summed up as follows: 1. The O equilibrium between the blood and gas-mixture is not completely established even at the end of one hour, when the original partial pressure of the O in the mixture was very high or very low. 2. The O tension of the blood always remains below the partial pressure of the O in the pulmonary alveoli. 3. The CO₂ tension of the arterial blood is about 3 per cent. of one atmosphere,—a figure which agrees closely with that given by Pflüger's pupils. 4. The conclusions of Pflüger are not affected by experiments on the arterial peptonized circulating blood of the dog.

MUSCLE.

Muscular Fatigue.—In a short paper, recounting experiments made upon frogs, Abelous⁴¹⁰_{p.437} shows that, in cases where the circulation is interrupted in one leg, general tetanization fatigues the muscles of that limb less readily than the others. On the contrary, if one limb is paralyzed by section of its nerve, general tetanization will cause fatigue in the muscles of this limb, although they have not been directly stimulated. This latter result agrees with the results of experiments upon the human being made by Mosso (ANNUAL, 1891). Abelous explains his results by supposing that the waste products of muscular contraction cause an auto-intoxication which affects first the endings of the nerve-fibres in the muscles, bringing on a condition similar to that caused by curarization.

Excitability of Muscle After Death.—By means of his newly-invented instrument, the myophone, d'Arsonval¹⁴_{July 5} has been able to show that, long after a muscle ceases to respond to stimulation by a visible contraction, there is still a response, of the nature of a molecular movement, which can be detected by his instrument. The myophone is a special modification of the microphone, and, among other interesting results obtained with it, he has demonstrated the actual existence of muscular tone. When connected with a muscle at rest, but not deprived of its nerve, a tone corresponding to the innervations of the muscle may be heard; this tone disappears when the nerve is cut or the animal is curarized. In warm-blooded animals a tone may be obtained from the muscles, upon stimulation through the nerve, as long as three hours after somatic death, showing a retention of irritability by nerve as well as muscle.

Action of Oxalate of Potash on Muscle.—Cavazzani⁴⁰⁹_{v.18,p.156} finds that the injection of oxalate of potash into the blood-vessels of a frog destroys the property of the muscular tissue of entering the condition of rigor mortis, and also suspends or destroys its physiological irritability. If muscle-plasma is prepared from a frog's muscle according to the method of Kühne, addition of potassium oxalate will prevent it from undergoing the myosin coagulation. In his injection experiments Cavazzani made use of a 5-per-cent. solution of potassium oxalate, and 1 cubic centimetre of this solution injected into the aorta was sufficient to prevent rigor and destroy irritability. This action of the oxalates is supposed to depend

upon the fact that they precipitate the calcium as an insoluble salt. As some proof for this it was found that subsequent injections of calcium salts (CaCl_2 1 per cent.) were followed by a partial recovery of muscular irritability. The author believes that if the Ca added could be properly controlled, there would result a complete recovery of functional irritability in the muscular and nervous tissues. Locke also ¹⁷⁸_{v.15,p.119} makes a short preliminary contribution upon the effect of sodium-oxalate solutions on the voluntary muscles. The sartorius muscle of the frog was immersed in 0.75-per-cent. solutions of sodium oxalate. Violent contractions of a peculiar character follow the immersion, and, after a short time (one-half to three-fourths hour), the muscle loses its irritability, but does not go into rigor. Subsequent immersion in a calcium solution brings about a partial return of irritability.

Alterations in Strength which Occur during Fatiguing Voluntary Muscular Work.—Lombard ¹⁷⁸_{v.14,p.97} records quite a number of experiments on himself and others for the purpose of determining the character and causes of the alterations in the strength of voluntary contractions, whose existence he has called attention to in previous papers. The experiments were made on the flexor muscle of the second finger and on the abductor indicis, which the subject, with his whole attention concentrated on the work, was instructed to contract once or twice a second, the movements of contraction and relaxation being synchronous with the forward and backward swing of a pendulum or metronome. Even when the weight was not raised through the coming on of fatigue, the attempts to raise it were continued at the same rate, and always with the greatest possible effort. For the arrangement of the apparatus the reader is referred to the original publication. The variations in the size of the contractions obtained in these experiments may be separated into two groups: (*a*) There are alterations extending over considerable periods; the contractions more or less quickly diminish in size until they reach a very low level; this level may be maintained for some time without any marked variations, when, either suddenly or gradually, there comes an increase of strength, and the succeeding contractions form a series at a higher level. This may be followed by a second loss of power, and this by a return, etc. The author calls these "major variations," to distinguish them from others (*b*) of shorter duration, which appear as small

groups or as single contractions of a size differing in a greater or less degree from the contractions immediately preceding or following. Both kinds of variations are quite unavoidable, and are not the result of inattention; they remain even when the subject is called on to make special efforts to lift the weight. They are also quite independent of each other, as one finds the minor variations persisting in spite of a major recovery at one time; at another time there may be a major variation accompanied by an almost-complete cessation of minor variations. When the experiment was modified so that the subject attempted to keep a muscle continuously contracted and a relatively large weight raised as high as possible, the result showed clearly variations of the kind described above.

Moreover, the author finds the same variations in a series of knee-jerks which are excited at frequent intervals, and each time by blows of the same force, when the subject is as nearly as possible both bodily and mentally at rest and when no re-inforcing cause can be detected. As to the causes underlying these variations, Lombard demonstrates beyond doubt that they do not depend on alterations in the attention or on the attitude of the mind of the subject toward the work. It was, moreover, impossible to discover any relation between the alterations of the strength of contraction, on the one hand, and respiration, heart-beat, or vasomotor changes, on the other. Lombard concludes that they depend chiefly on changes taking place within the central nervous system, possibly the motor cells of the cord, the changes being the result of many influences which are supposed to determine the chemical condition of these cells.

The rapid variations in the contractions indicate how greatly the irritability of these cells may alter within short intervals of time; for the diminution in the size of the contractions cannot be explained as the fatigue of the peripheral apparatus. Similar variations are not obtained when the muscle or its nerve is stimulated by induction shocks, and, moreover, it was found that the muscle responded to electrical stimulation, with little or no diminution of force at a point in the regular experiment, when the strongest voluntary effort gave little or no contraction.

The probability of the correctness of this explanation is increased by a consideration of certain striking facts which may find

their explanation in a similar cause. For instance, the purely mental processes of adding a long column of figures, or of reading a difficult passage in a book, undergo similar variations, effective and ineffective periods succeeding one another after fatigue sets in. And, again, the "loss of breath" during muscular exercise and the "recovery of second wind" may be a similar phenomena of fatigue, especially when it is remembered that exactly the same variations are presented by the knee-jerk, which is beyond the control of the will, and by the voluntary muscular movements.

The reference of the phenomenon to the central nervous system makes it less difficult to understand the great individual differences to which the author calls special attention. In this respect his results fall in line with those of Mosso on fatigue, the records of different men being so unlike one another that they may almost be regarded as expressions of their individuality.

NERVOUS SYSTEM.

Nerve-Impulse.—De Boeck⁸⁶⁸_{p.143} makes a very interesting contribution to general nerve physiology in some experiments undertaken to determine whether or not there is a noticeable production of heat in a nerve-fibre during the conduction of a nerve-impulse. To measure the heat production he used an electric resistance thermometer, *i.e.*, a thin strip of metal (lead), whose resistance varied with its temperature. When such a thermometer is intercalated in a Wheatstone-bridge arrangement with galvanometers, minimal variations in temperature may be detected. With the apparatus employed by the author he calculates that a quantity of heat less than $\frac{1}{10000}$ calorie could be detected. His experiments differ from those of Rolleston and of Stewart (ANNUAL, 1891, 1893) in the construction of the thermometer and in the fact that the nerve-fibres were stimulated normally through their end-organs. As the result of experiments made upon frogs and rabbits he concludes that there is no sensible production of heat during functional activity. The paper ends with a very instructive discussion of prevailing opinions as to the nature of the nerve-impulse. The author naturally favors the view that the impulse is not a progressive series of chemical decompositions; he believes that it is a physical change, though not merely a vibrating movement. He has constructed an artificial nerve-fibre upon the arrangement suggested

by d'Arsonval. A glass tube was filled with alternate discs of olive-oil and a mixture of alcohol and water of the same specific gravity as the oil. The ends of the tube were closed with membranes of gutta-percha and were connected with a galvanometer. It was found that any contact upon the membranes at the end was propagated through the series of discs as a liquid wave, and was accompanied by an electric variation similar to a negative variation in a nerve-fibre, but not by any modification of temperature. The electric variation is explained as the result of variations in surface tension between the discs arising from the displacement. The author quotes Demoor as having shown that the central core of the axis-cylinder is made up of heterogeneous discs corresponding to the nodal and internodal spaces, and that the axis-cylinder, therefore, may be regarded as an electro-capillary system in which the normal excitation is transmitted by modifications of superficial tension in the successive heterogeneous segments. Such a view accounts for the transmission of a nerve-impulse without chemical change and heat production, and explains also the well-known electric phenomena, but it leaves untouched the nature and origin of the force producing the variations in surface tension.

Proteids of Nerve-Tissue.—Halliburton¹⁷⁸_{p.90} has made an investigation of the proteids found in the gray and white matter of the nervous system. As regards the normal reaction of nerve-tissue he finds that, like the other tissues of the body, it is alkaline, but that after death the alkalinity diminishes and eventually is replaced by an acid reaction. The change takes place more rapidly in the gray matter. Quantitative examination of the gray matter shows that the proteids make up more than 50 per cent. of the solid matter; the proportion is less in the white matter, and still less in the nerves. On the other hand, gray matter is poorest in total solids, and nerve is richest. As to the character of the proteids present, he distinguishes three varieties: A globulin with a temperature of heat coagulation of 47° C. (117° F.), for which he proposes the name of "neuro-globulin α ." This seems to be analogous or identical with a globulin found in other tissues of the body,—*e.g.*, cell-globulin α of lymph-cells, paramyosinogen of muscle, etc.; a globulin with a coagulation temperature of 70° to 75° C. (158° to 167° F.), for which he proposes the name of "neuro-globulin β "; a nucleo-albumen which is found most abund-

antly in the gray matter. This latter proteid is prepared most easily by precipitating an aqueous extract of brain by acetic acid. It coagulates at 56° to 60° C. (133° to 140° F.). The relative proportions of the three proteids are not stated. Like the other nucleo-albumens, the one found in nerve-tissues, when injected into the blood-vessels, tends to set up intra-vascular clotting, and when mixed with calcium chloride acts like fibrin ferment in promoting extra-vascular clotting.

Modifications of the Spinal Cord After Amputation.—Pelizzi⁴⁰⁹_{v.18, No.26} reports two cases of amputation,—one of the arm, made eleven years before, and one of the leg, made ten years before,—in which he made a microscopic study of the cord. He was able to determine in each case a well-marked atrophy of the following localities: The postero-lateral group of nerve-cells, in the anterior horn; the column of Burdach, both ascending and descending, at the levels of the corresponding spinal nerves, and in the case of the leg the column of Goll at a higher level of the cord; the lateral limiting zone of white matter; the posterior horn and the column of Clarke; the anterior column of white matter on the opposite side. The atrophy seemed to consist essentially in a diminution in size of the white matter,—i.e., the myelin sheaths, and of the nerve-cells.

In neither case was he able to discover any proliferation of neuroglia, infiltration of leucocytes, or fragmentation and absorption of axis-cylinders and myelin, such as occurs in the degeneration of nerve-fibres after section. The atrophy in these cases, it may be assumed, affected the paths of the sensory fibres in the cord, following upon the suspension of functional activity. The results obtained, therefore, in these and similar cases, may prove useful in determining the sensory tracts in the cord. The most-striking result of the examinations was the well-marked atrophy in the postero-lateral group of nerve-cells in the anterior horn, and this group may, therefore, be looked upon as forming a terminus for some of the sensory fibres upon their entrance into the cord.

It is quite interesting also to note that the atrophy of the column of Burdach extended both upward and downward, since this agrees with the recent histological discovery, that the sensory fibres of the posterior root enter the cord in the column of Bur-

dach and there branch, a short stem passing downward and a longer one upward, each in turn sending off several collateral branches at right angles.

Knee-Jerk.—It has long been known that the integrity of the afferent paths is requisite for the production of a knee-jerk, but Sherrington²⁰⁸¹_{v. 62, p. 556} proves, on lower animals, that the afferent fibres in question are precisely those coming from the extensor muscle itself. As long as these particular fibres are intact, other sensory fibres in the same root may be destroyed without preventing the knee-jerk. These fibres from the extensor muscle enter the cord in the posterior root of the fourth lumbar in man, the fifth lumbar in Rhesus, and the sixth lumbar in the cat, and they are very sensitive to injury,—more so, at least, than the sensory fibres from the skin. He found, for example, that the conductivity of this set of fibres could be interrupted by cooling, by cocaine, and by the action of CO₂ vapor, thereby abolishing the knee-jerk. On the other hand, section of the nerve to the hamstring (flexor) muscles causes an increase in the knee-jerk, and this follows whether the anterior or the posterior roots of the nerves supplying these muscles are severed. The increased strength of the kick in this case is not to be explained simply by the removal of the antagonistic (tonic) action of the flexors. For, if the central end of the divided nerve supplying the hamstrings is stimulated, the knee-jerk will at once disappear. Or, if the nerve is left intact and the hamstrings are loosened at their attachments and mechanically kneaded so as to stimulate their sensory fibres, the knee-jerk will likewise be lessened or abolished altogether. From these facts Sherrington concludes that normally the sensory nerves of the hamstring-muscles convey to the cord tonic impulses which depress the knee-kick. He attempts to show, in addition, that there is an intimate nervous correlation between the antagonistic muscles round the knee-joint, of such a character that tension in one increases the tone of the other, as well by a true reflex through the cord as by direct mechanical action.

The latent time of this interesting phenomenon, which is of so much importance in determining its true character, has been repeatedly investigated since 1875, but the results hitherto have shown too much discrepancy to lead to a satisfactory result. Applegarth²¹⁵_{Mar.} tabulates these results as follows:—

Worker.	Latency.
Tschirjew,	0.0595''
Gowers,	0.100
Waller,	0.035
Brissaud { Normal,	0.050
{ Hemiplegia,	0.015
Eulenburg,	0.024
A. de Watteville,	0.025
Rosenheim { Normal,	0.04313
{ Hemiplegia,	0.025
{ Rabbits { Normal,	0.033
{ Brain excluded,	0.023

In most of these determinations the contraction of the m. quadriceps femoris was recorded by instruments which depend on the swelling of the muscle as it contracts. As this method is not likely to indicate the exact moment when the contraction begins, Applegarth devises a more-accurate method by which the moment of striking the patellar ligament and beginning of the ensuing contraction are recorded by means of electric signals on the smoked plate of the pendulum myograph. His experiments were made on three dogs, in two of which the influence of the brain was eliminated by section of the spinal cord at the level of the last dorsal vertebra, while the other was normal.

A large number of determinations, in which the greatest care was taken both in regard to the condition of the animals and the delicacy of the apparatus, gave him the following results:—

Dog A (spinal cord cut),	0.01068''
Dog B (spinal cord cut),	0.01106
Dog C (normal),	0.01328

It goes without saying that the latent periods of the signals themselves were accurately determined and the observed times corrected accordingly. These results were all obtained when he used the extension of the leg to break the current in the signal which recorded the instant when contraction begins. When the apparatus was slightly modified so that the contraction made the contact, he obtained the following results:—

Dog B,	0.01197
Dog C,	0.01720

For the sake of comparison, the author also tried the method which depends on the thickening of the muscle to break connection, and obtained a somewhat greater result; thus:—

Dog B,	0.01451
Dog C,	0.01936

In addition to establishing what we may regard as accurate figures for the latent time of the knee-jerk in dogs, the paper is of interest in verifying the influence of the brain on this phenomenon, affecting not only its extent, as Lombard has shown, but also the latent period, which is very evident from a comparison of the figures for the Dog C with those of A and B.

Efferent Fibres in the Optic Nerve.—It has been shown, by experiments of Grijus, that stimulation of the retina of one eye will cause a variation in the retinal current of the other eye,—a fact which seems to imply the possibility of a reflex from one optic nerve to the other, and therefore the existence of centrifugal fibres in the optic. Nahmmacher^{246 Jan. 6} has corroborated this general result by experiments upon the effect of stimulation of one retina upon the position of the cones in the other. In eyes exposed to the light the cones move into a proximal position with reference to the limiting membrane, whereas when kept in the dark they move away from the membrane. Taking advantage of this fact, Nahmmacher kept animals in the dark until the cones could be supposed to have taken a distal position; the lens was then removed from one eye and a crystal of salt was inserted so as to act as a chemical stimulus to that eye. After a proper interval the retina of the other eye was removed, hardened in HNO_3 , and examined in fresh sections as to the positions of the cones and compared with other sections from the eyes of control frogs. In other cases the stimulus was applied directly to the optic nerve or chiasma, and in still others the series first described was repeated after section of the optic nerve on the side not stimulated. The general character of the results may be gathered most easily from the following summary of the experiments.

I. Reflex stimulation of optic nerve (retina) in the other eye:

In 15 cases a proximal position of cones	13 times	= 86.6 per cent.
In 12 " a mesial " " "	2 "	
Control.—In 52 cases a proximal position	8 times	= 15.4 per cent.
In 52 " a mesial " "	6 "	
In 52 " a distal " "	38 "	

II. Direct stimulation of the nerve at the chiasma:

In 51 cases a proximal position	42 times	= 82.3 per cent.
In 51 " a mesial " "	3 "	
In 51 " a distal " "	6 "	
Control.—In 98 " a proximal " "	18 times	= 18.4 per cent.
In 98 " a mesial " "	2 "	
In 98 " a distal " "	78 "	

The results seem to show quite clearly that there are efferent fibres in the optic nerves capable of affecting the position of the cones, and that these fibres may be stimulated from the retina of the other side. In regard to this last action the author seems to think it is a reflex through the brain (anterior corpora quadrigemina), and not dependent upon commissural fibres between the retinas.

Cerebellum.—The most extensive and thorough research upon the physiology of the cerebellum which has appeared within recent times is found in a new book by Luciani.²⁰⁸⁰ His experiments were made upon monkeys and dogs. The method of operation is carefully described, and the main point of the research lies in the careful study of the permanent effects of the operations. The extent of the removal varied,—in some cases part of one hemisphere, in some cases an entire hemisphere, and in some cases the whole cerebellum. The general results of these operations are classed under five headings: 1. Irritative phenomena (*Reizerscheinungen*), comprising the immediate results of an operation, and due to stimulation of the connected portions of the brain. 2. Permanent losses of function (*Ausfallerscheinungen*). 3. Compensation phenomena, either organic or functional, and exhibited by the cerebellum or other parts of the brain. 4. Degeneration phenomena, secondary in nature, due to sclerosis of nerve-tracts or nerve-centres upon which the cerebellum has a trophic influence. 5. Dystrophic phenomena, general or local nutritive changes indirectly following the loss of innervation from the cerebellum.

As to the first of these results, the temporary symptoms due to irritation, he found that, whether the injuries to the organ were large or small, symmetrical or unsymmetrical, unilateral or bilateral, the resulting muscular phenomena differed in intensity, and not in character. He infers, therefore, that the cerebellum is a functionally homogeneous organ, not showing any localization of function. These irritation movements were stronger, however, the deeper the injury extended into the white substance toward the isthmus. Another important generalization made from a study of the effects of such operations is that the relation of the cerebellum to the body musculature is principally direct, each half controlling mainly its own side. This corroborates the well-known clinical fact that atrophy of one of the cerebral hemispheres is usually

associated with atrophy of the opposite cerebellar hemisphere. The irritation phenomena pass off more or less quickly; the difficulty of swallowing disappears very soon; the animal is able to swim before he can walk, owing probably to the smaller amount of muscular energy required, but gradually acquires the power of standing and moving. He lays emphasis upon the fact that the rotation phenomena observed after hemi-extirpation are toward the sound side, whereas in simple section of the crura they are toward the operated side, showing that, in the first case, there is an actual stimulation of the efferent fibres as opposed to the mere removal of innervation which obtains upon section of the crura. When he comes to explain how irritation in the cerebellum produces the rotation movements, he is naturally somewhat indefinite. He believes that the nerve-centres directly affected are the collections of gray matter in the pons. Marchi has shown that these centres suffer complete sclerosis after removal of the cerebellum, and Luciani considers them as focal centres through which the cerebellum is connected with both motor and sensory tracts. These rotation movements depend in part upon stimulation of the sensory fibres, giving rise to vertigo sensations, and in part upon stimulation of the motor fibres, interposing an obstacle of some sort to voluntary motor innervation. Since the resulting inco-ordination of movement is not accompanied by any actual loss of power in individual muscles, but only by an alteration in the arrangement or form, he proposes to designate them as dysmetric movements. As the more easily noticeable phenomena of irritation pass off, the permanent effects of removal become apparent. He found that the latter were more manifest in the hind-limbs as the former had been in the fore-limbs. As to the character of the permanent losses of function, he makes the generalization that they concern only the neuro-muscular apparatus, and do not affect the sensations, instinct, or intelligence. He makes a special point of the muscular sense, which, he says, is not impaired. In their nutritive and sexual desires the operated animals showed, if anything, an increased appetite, and this was especially true of their sexual nature; pregnancies and births were frequent. He classifies the permanent effects of cerebellar removals, as far as they affect the nerve-muscle apparatus, under three heads: 1. A distinct asthenia, manifesting itself in a tendency to fall to the operated

side, especially when locomotion was long continued or was hindered by a weight to be pulled. 2. There was a marked *atonia*, loss of nerve- and muscle- tone. The animal, held in the air, showed a more-pendent position of the limbs on the operated side. In ascending stairs the legs were raised higher than necessary, and were brought down with unusual force, owing to the lack of tonicity in the antagonistic extensors in the first case, and flexors in the second. 3. *Astasia*, manifested chiefly in trembling movements of the head and parts of the body not in contact with the ground.

He seems to think that the trembling was due, in part, to an alteration in the rhythm of motor innervation, resulting in incomplete tetanic contractions of the muscles. In sustained movements the trembling passed into a pendular or swinging motion, caused by the alternate contractions of the flexors and extensors. As these are the three marked permanent effects of extirpation of the cerebellum, it follows that normally this organ is to be looked upon as a great sthenic, tonic, and static centre for the musculature of the body, and exerting this influence through both sensory and motor tracts. As to the secondary degenerations resulting from extirpation, Marchi ascertained that they appeared chiefly in the gray matter of the pons, in the red nucleus, and in the lower olives. The trophic disturbances varied with the time after the operation. During the period of irritation there were general nutritive disturbances, manifesting themselves in glycosuria, acetoneuria, and polyuria. During the course of the cerebellar ataxia there might occur alternating periods of increase and diminution in weight, and in some cases a condition of marasmus developed, ending in death. There seemed to be less power of resistance to disease, wounds healing with great difficulty. All these dystrophic results he considers as secondary, and not immediate, results of the operations.

CIRCULATION.

The Plateau of the Ventricle Contraction.—V. Frey¹⁸²_{Mar.7} contributes a critical and experimental paper upon the form of the contraction curve of the ventricle. He is convinced that the plateau, which most observers have described as a constant peculiarity of this curve, is caused, for the most part, by an error in

recording. In general, he believes that where an open sound is pushed into the ventricle, if the free end does not lie properly in the cavity, it will be blocked by the contracting walls at a certain point, and thus cause the flattening of the apex of the curve. Whenever the heart-contraction may be considered as incomplete, *e.g.*, in an irregular or weakened heart, after vagus inhibition or aortic stenosis the plateau disappears. He explains the plateau of the classical curves of Marey and Chauveau, in which a balloon was used at the end of the sound, and, therefore, the explanation given above does not hold, by calling attention to the fact that this curve is not drawn to equal ordinates for equal increments of pressure. If the curve is reconstructed upon the basis of ordinates proportional to the pressures, the plateau disappears from the curve. V. Frey describes the normal curve as having a steep rise and fall and a single blunt apex.

Fredericq²⁶⁵_{Apr. 22} repeats the experiments of von Frey, and obtains a similar curve when he uses Frey's tonometer to record the pressure changes. But when he substitutes a Gad or Hürthle manometer or Chauveau-Marey's modified sphygmoscope, the usual systolic plateau with its three apices returns, whatever the position of the sound with reference to the ventricular cavity. These latter recording instruments have a short latent period (0.015 to 0.02 second for strong and rapid variations of pressure), while von Frey's tonometer has a latent period of 0.04 to 0.05 second, and the author is led to attribute the latter's aberrant result to this deficiency of sensitiveness in his recording apparatus. The point that remains to be decided is whether Fredericq's curve may be produced by independent oscillations of his apparatus or not, since von Frey has offered this explanation in a later brief communication.²⁶⁵_{B. 7, No. 3}

Nutrition of the Frog's Heart.—Albanese³¹⁵_{v. 32, p. 297} reports the results of some experiments undertaken to determine what composition is necessary for a nutrient liquid capable of keeping the heart beating, and in a condition to do its maximum work. Heffter had previously shown that a 2-per-cent. solution of gum arabic containing red corpuscles is capable of keeping the heart in this condition, and Albanese shows that the same result is obtained when the corpuscles are made laky by freezing and then mixed with the gum solution. He found, moreover, that a gum solution made alkaline with sodium carbonate, and isotonic by the addition of

sodium chloride, also kept the heart beating normally as long as it was saturated with oxygen. When deprived of oxygen by a stream of hydrogen-gas, it failed to nourish the heart. When a similar solution, deprived, however, of its sodium chloride, was used, the heart likewise was incapable of work, coming to a stand-still in diastole. Finally, an isotonic solution of sodium chloride kept saturated with oxygen is known to be incapable of maintaining the contractility of the heart, lacking, according to the author, the necessary degree of viscosity. Albanese concludes, from these experiments, that a proper nourishing liquid to the heart must fulfill three conditions,—it must be isotonic, it must contain oxygen, and it must possess a certain degree of viscosity.

Action of Inorganic Salts upon the Heart.—Howell and Cooke¹⁷⁸_{v.14,p.198} have shown that the inorganic salts of blood, milk, and gastric juice are capable, without the presence of any proteid, of keeping the frog's heart beating for many hours, acting nearly as well, in fact, as blood-serum itself. Taking this fact in connection with the experiments of Ringer, who has shown that a solution containing a certain proportion of sodium chloride, potassium chloride, and calcium phosphate will maintain the heart in rhythmic, forceful contraction for long periods, the authors suggest that in blood and in all so-called nutrient liquids it is the inorganic salts, and not the proteid, which act as the source of the heart's irritability. They point out especially that the statement of Kronecker and others, that only liquids containing serum-albumen are capable of maintaining the heart's contractility, is erroneous. Their conclusions are substantiated by a second series of experiments by Howell and Eaton,¹⁷⁸_{v.14} in which it was shown that blood-serum, deprived of its calcium salts by the addition of sodium oxalate to a strength of 0.1 per cent., is entirely unable to keep the heart beating, although the proteids are present in normal proportions; whereas, the addition of a little calcium-chloride solution to the decalcified serum at once restores its power of maintaining the heart in normal contraction.

The Influence of CO₂ on the Frog's Heart.—S. Ringer¹⁷⁸_{v.14,p.125} reports experiments which demonstrate that the rapid loss of contractility and irritability by the frog's heart, which is fed with ordinary saline solutions, is accounted for by the CO₂ absorbed by these saline solutions from the air. After boiling the solution

three hours or more, to remove the CO_2 , it will maintain the beat very much longer. On the other hand, the well-known salt mixtures prepared with water free from CO_2 , or diluted serum, which are so efficient in preserving the beat, when saturated with CO_2 lose this property in a large measure. These solutions, thus treated with CO_2 , give a double reaction with delicate litmus-paper, turning it red at first, but, on exposure, the red gives place to a blue color. The author leaves it open whether the injurious effect of the CO_2 is the result of this acid reaction or whether it has some specific action on the heart. Salt solutions containing CO_2 were neutralized with KOH or NaOH, and then were able to maintain the beat for a long time, although its character was changed; the result was, in fact, similar to that obtained by the addition of sodium bicarbonate to saline solutions containing no CO_2 . The injurious effect on the heart could also be removed if the experiment had not been carried to the extent of complete loss of irritability, by substituting a saline solution containing a considerable quantity of lime as sulphate and bicarbonate. The lime neutralizes the CO_2 in the ventricle, which then recovers through the action of the potassium and calcium salts present. The author also corroborates his previous results in regard to the action of several inorganic salts on the heart, by using saline mixtures prepared with boiled distilled water. He finds, as before, that neither potassium chloride nor sodium bicarbonate, used singly or together, are adequate to sustain contractility. Calcium nitrate restores contractions when added to salines, but induces some tonic contraction and greatly delays the dilatation; these undesirable effects are corrected by the addition of a suitable quantity of potassium chloride.

Circulation in the Brain and Abdomen.—E. Wertheimer ⁴¹⁰_{v.4, No.2} publishes a series of experiments on the circulation of the brain which confirms the observations of Gaertner and Wagner, Knoll, Hürthle, and Roy and Sherrington, and furnishes him data for a new explanation of the phenomena observed by these different observers. By taking simultaneous tracings of changes in the volume of the brain and kidney and of the blood-pressure in the femoral artery the changes in calibre of the vessels of the encephalon are compared with those of the abdominal organs under various conditions. The present research deals only with such factors as produce a rise of

pressure by causing a vascular constriction in the abdominal region. He finds, in harmony with previous investigators, that stimulation of any sensory nerve (central end of sciatic) produces an increase in volume of the brain, running parallel with the rise of general blood-pressure. Since the same result is obtained in dogs deeply narcotized with chloroform, by stimulation of the peripheral end of the splanchnic nerve, and when the rise of blood-pressure did not amount to more than one or two centimetres of mercury, it is admitted that the dilatation of the cerebral vessels may be principally due to a mechanical distension, as Roy and Sherrington had suggested. This is rendered the more probable by the fact that the vessels of the brain yield to such an influence with remarkable facility. Asphyxia, however, and various alkaloids, such as strychnia, nicotine, and ergot, produce a similar result; that is to say, they increase the blood-pressure by constricting the vessels of the abdominal organs, while the vessels of the brain are dilated,—and this reciprocal effect must be explained in another way. The low pressure in the jugular veins and the fact that inverse changes in volume of brain and kidney, respectively, may still be observed when the asphyxia, for instance, has not yet appreciably influenced the general blood-pressure indicate that the enlargement of the brain is not the result of back-pressure in the veins, but that one has to deal here with an active vaso-dilatation on the one hand (brain), and vaso-constriction on the other (kidney). The more so, since the slowing of the heart-beat shows that the medulla has undoubtedly responded to the influence of the beginning asphyxia. This accounts for the fact pointed out by Dastre and Morat that the pressure-changes in asphyxia do not follow a constant rule, the dilatation in the one region tending to counterbalance, sometimes completely neutralizing, the constriction of the other. The author concludes, therefore, that the brain-vessels are supplied by vasomotor nerves, which reach them through the cervical sympathetic, but whose exact course is not yet definitely known. Strychnia and nicotine are known to produce hyperæmia of the lips and tongue, by stimulation of vaso-dilator nerves going to those parts; so that the brain does not stand as an exceptional region in which vaso-dilator influences predominate when the vasomotor centre as a whole is stimulated. It is not necessary to assume, as Roy and Sherrington have done, that the vascular dilatation in the brain,

under these circumstances, is due to the local effect of products of metabolism acting directly on the vessels.

The rise of blood-pressure produced by the application of cold to the surface of the body is generally supposed to find its explanation in the fact that the blood is driven from the superficial vessels into the deeply-seated organs. The author shows that this is not the case; the vessels of the abdominal organs actually contract, as shown by the diminution of the volume of the kidney, behaving in this case just as in the case of stimulation of sensory nerves. The vessels of the brain alone dilate, as Schüller and Fredericq had already pointed out, here again presenting a contrast to the abdominal organs. The effect on the abdominal organs is not an emotional effect, due to fright from the sudden application of cold, but is permanent, and may be produced repeatedly in the course of the same experiment; moreover, it disappears on removal of the cold. The advantage of this peculiar mechanism to the organism is readily apparent. When peripheral stimulation requires increased activity of the nerve-centres, it at the same time furnishes the brain with increased material for its manifestation. Anæmia of the brain also, from any cause, tends to provide its own remedy, since the consequent stimulation of the vasomotor centre determines a flux of blood from the abdominal organs to the central nervous system, by producing a vaso-constriction in the former, a dilatation in the latter. Finally, the injurious effects of a cold bath after meals is explained, since the congestion of the nerve-centres produced thereby must be enormous; not only the blood from the superficial vessels, but part of that in the abdominal organs is driven to those centres.

Rhythm of Heart.—Kaiser ³⁹¹_{B.11,H.2} concludes, after a critical examination of the two most important facts adduced in support of the myogenic theory of the heart-beat,—*i.e.*, the rhythmic action of embryonic hearts and of the hearts of lower animals, which contain neither nerve-cells nor nerve-fibres,—and the possibility of setting the ventricle apex into rhythmic action under suitable conditions, that the rhythm of the normal heart is determined by the activity of its intrinsic nervous apparatus. An explanation of simple diastole, as well as vagus inhibition, was suggested by his experiments on the gastrocnemius, ³⁹¹_{p.417,*92} in which he found that the tetanus resulting from stimulation of the sciatic at one point could

be removed by throwing a second tetanic stimulus into the nerve at another point. Thus it may be supposed that a motor ganglion sends a constant stimulus along the motor fibres to the heart-muscle and throws it into contraction; by this contraction, either mechanically or otherwise, a second set of fibres may be stimulated and carry another impulse to the motor ganglion, and so produce interference, just as the two stimuli thrown into the sciatic neutralize each other. Each systole of the heart would thus become the direct cause of the following diastole; with the diastole the stimulation of the afferent fibres to the ganglion would pass off and a second contraction follows from the constant action of the ganglion, and so on. If this hypothesis is true, it follows that any augmentation of the contraction of the heart should be followed by a more marked and prolonged diastole; and this the author shows is actually the case by a series of experiments in which he stimulates the ventricles or auricles directly by means of induction shocks. To avoid an error which has often complicated the results of other investigators, unipolar stimulation is used, by which escape of current to other parts beyond the point it is intended to stimulate is prevented, and the movements of the heart are recorded by means of a lever,—a method which least disturbs the normal condition of the organ. The reader must refer to the original for the details of the method. It was found impossible, with any strength of stimulus, to set up an extra contraction of the ventricle when the stimulus was thrown in during the systole; and Marey's contrary result with strong currents the author explains by escape of current to the auricles, which, during ventricular systole, are relaxed, he having used the ordinary bipolar method. But, both in the auricles and ventricles a contraction may be started in any part of the diastole by direct stimulation, and this extra contraction is followed by a diastolic pause of from two-fifths to three-fifths of a second. The "refractory phase" of the heart is not due to a diminution of irritability during the systole, as Marey has suggested; the absence of any response to the stimulus simply follows from the fact that every contraction of the heart is normally a maximal contraction. If the extent of the contraction is diminished by injecting a small dose of muscarine, the author finds that these sub-maximal contractions can be increased by electrical stimuli applied during the systole. The above-mentioned prolongation of the

diastole can only be observed after a preceding extra contraction; and when Langendorf obtains a similar result with ineffective stimuli, it is to be explained by escape of current to the inhibitory mechanism of the heart. The prolonged diastole cannot be explained as fatigue of the motor ganglion, since the extra contraction was produced by direct stimulation of the heart-muscle; so that the ganglion had no part in it; nor as muscle-fatigue, since the rhythmically-beating apex will respond similarly to intercurrent stimulation without a subsequent increase in the pause. It follows, therefore, that the pause is the result of the stimulation of nervous elements by the systole. The arrangement of the nervous mechanism of the heart the author, therefore, represents as follows: Excito-motor ganglion cells lying at the junction of sinus and auricles send a constant stream of impulses to the musculo-motor ganglia at the base of the ventricle and in the auriculo-ventricular valves, from which they are distributed to the heart-fibres, and so contraction results (systole). The contraction stimulates sensory fibres, which, through the mediation of a third ganglion lying at the base of the ventricle, also send their impulses to the musculo-motor ganglion, and so interfere with the first set of impulses coming down from the automatic excito-motor ganglion (diastole). The third ganglion may be called the reflex-inhibitory ganglion of the heart, and, in addition to the sensory fibres of the heart, receives also the inhibitory fibres of the vagus. Since the pause depends on the afferent impulses to this ganglion, it follows that it must be prolonged by the stronger impulses resulting from a more-powerful contraction, while the increased rhythm following section of both vagi in many animals is explained by the loss of the re-inforcement which these afferent impulses receive from the constant impulses reaching the inhibitory centre along those nerves. During diastole the stimulation of the sensory fibres ceases, and the constant stimulus from the automatic centre leads in a second systole, and so on, the result being a rhythmic action of the heart.

RESPIRATION.

Respiratory Function of Certain Thoracic Muscles.—The two portions of the internal intercostal muscle known, respectively, as the “interosseous” and the “intercartilaginous” are now generally believed to differ diametrically in function, the former being regarded

as expiratory, the later as inspiratory. This belief, however, being based chiefly on anatomical considerations and *a priori* arguments, Hough²¹⁵_{Mar.} undertook to place it on a firm physiological basis by taking simultaneous tracings of isolated portions of these muscles and of the diaphragm in the dog. His tracings show conclusively that the usual view is correct, the contractions of the intercartilaginous portion of the internal intercostal being exactly synchronous with those of the diaphragm, while the contractions of the interosseous portion alternate with those of the diaphragm.

Incidentally, Hough also examined the external intercostal and the triangularis sterni, and verified the inspiratory function of the former and the expiratory function of the latter. The question as to whether these muscles all take part in normal quiet breathing he answers in the affirmative, although the conditions of the experiment render a decision somewhat difficult. This much, at least, is certain, that a very slight increase of costal respiration from beginning dyspnoea at once throws them into activity.

Differential Respiration.—Martin and Dreyer²¹⁵_{Mar.} have recently published a preliminary account of some experiments which were undertaken for the purpose of determining the physiological effects of “differential respiration,” as it was practiced of late years with the so-called “pneumatic cabinet.” The experiments were made on cats, and the conditions were such that, while they breathed atmospheric air at the normal pressure, the pressure on the surface of the body inside the cabinet could be changed at pleasure. In the experiments recounted in this paper, rarefaction only was used, varying in different cases from 5 millimetres to 55 millimetres of mercury. The breathing movements of the animal were observed directly through the glass top of the cabinet, while the blood-pressure in the carotid artery and the condition of the pressure in the cabinet were recorded on a Ludwig kymograph. The results obtained may be briefly summarized as follows: 1. A rarefaction of 15 millimetres of mercury produces mechanical apnoea; the thorax is widely distended and the expiratory muscles do not seem to be able to overcome the resistance offered them by the difference between the intra-thoracic and extra-thoracic pressure. 2. Rarefaction also lowers the blood-pressure, the fall of pressure varying directly with the rarefaction, as the following table shows:—

Rarefaction.		Fall of Arterial Pressure,	
0.6 millimetre of mercury.		40 millimetres.	
1.4 millimetres	"	60	"
2.7	"	120	"
5.7	"	177	"

Similar experiments made on cats after ligation of the abdominal aorta above the origin of the cœliac axis gave exactly the same result; that is to say, for a given amount of rarefaction the fall of blood-pressure was as marked as before, showing that the fall of pressure is not the result of gorging of the vessels of the skin and abdominal viscera. The explanation given is that the blood is held back in the lungs,—a good instance of what has been called “internal bleeding,” and is thus prevented from reaching the heart.

DIGESTION AND NUTRITION.

Gastric Digestion.—Chittenden and Amerman¹⁷⁸_{June} have tried to arrange an artificial gastric digestion under such conditions that the peptone formed during digestion should be removed, in part at least. This end was attained by carrying on the artificial digestion in a tube of parchment, which was swung in a large vessel of dilute hydrochloric acid. It was supposed that the peptones would be removed by dialysis, and the object of the experiment was to determine whether, under those conditions, a complete peptonization of food could be obtained, or at least a more complete conversion to peptone than is possible in ordinary artificial digestions. The results of five comparative experiments showed that there was no marked difference in the final proportion of peptones and proteoses between digestions in a flask and in the dialyzing apparatus. This result tends to confirm the view, previously advanced by Chittenden, that gastric digestion is a preliminary stage to the more-complete proteolytic digestion carried on in the intestine. In a single experiment, made upon a man, it was found that in the liquid which could be recovered from the stomach there was about 76 per cent. of proteoses against 23 per cent. of peptone. One of the results of the experiments was a determination of the rate of diffusion of proteoses through parchment. Their diffusibility was not inconsiderable, amounting, in some cases, to about 8 per cent. Deutero-albumose was apparently less diffusible than proto-albumose.

Influence of Light on Animal Metabolisms.—That animals in

the light eliminate more CO_2 than those kept in the dark seems now to be an established fact; but what effect the light has upon the nitrogen elimination has not been so satisfactorily determined. Gräfenberger¹⁸²_{v.53,H.5,6} has attempted to determine this latter point by experiments made upon rabbits. Two animals were used; one was kept in a cage near a window; the other was kept in a dark room, though the light was not absolutely excluded. They were fed upon known and equal amounts of food, and the nitrogen of the urine and fæces was determined at the end of periods of four days. As far as the weight of the animals was concerned, it was found that, after forty days, the one kept in the light had gained only 29 grammes ($7\frac{1}{2}$ drachms), while that in the dark had gained 129 grammes ($4\frac{1}{4}$ ounces). The experiments made to determine the nitrogen gain, however, showed that during the period of about eleven days, over which the observations had been extended, there was a deficit of nitrogen in the excreta, as compared with the ingesta, of 2.8203 grammes ($43\frac{5}{8}$ grains) in the rabbit kept in the light, and 2.5277 grammes ($39\frac{1}{4}$ grains) in the rabbit kept in the dark. In other words, the absence of light had not materially altered the nitrogen metabolisms, although it influences so distinctly the formation of CO_2 . Examination of the fæces compared with analysis of the food showed that the proportion of the food actually digested and absorbed was practically identical in the two cases, with the exception of the fats; these were more completely utilized by the animal kept in the light than by the one in the dark. The glycogen formation in the liver, as long as food was supplied plentifully, remained practically the same. Observations upon the amount of hæmoglobin under the two conditions were made by means of a Fleischl hæmoglobinometer. It was found that in the dark the amount of hæmoglobin was at first diminished, but subsequently increased; this latter change was, however, accounted for by the fact that the total quantity of blood was diminished. From an agricultural stand-point, the most valuable outcome of the work was the discovery that the animal kept in the dark laid on fat more rapidly than the one in the light, provided the exclusion of light was not too complete and the duration of the exposure was not long.

Fistula between Portal Vein and Inferior Cava.—Some years ago Eck described a method for making a fistula between the

inferior cava and the portal vein, but the operation seems not to have been utilized to the extent that one would have anticipated. Quite recently four of the professors in the Institute for Experimental Medicine, at St. Petersburg, Hahn, Massen, Nencki, and Pawlow,²⁷³
v. 32, p. 161 have collaborated, in an investigation upon dogs, the effect of thus removing the portal circulation from the liver. A careful description is given of the technique of the operation. It is not possible to repeat the description in a brief abstract. It is sufficient to say that the veins were laid side by side and sutured together along their length, after which, by a specially-devised instrument, the walls in contact were cut open longitudinally, bringing the two into communication. The greatest care was taken to make the operations aseptic. The operations were made upon some sixty dogs, of which about two-thirds died from one cause or another. One of the immediate noticeable results of the operations was a change in the dogs' dispositions. Those that were good-tempered became unpleasantly vicious. The animals showed, usually, a sequence of phenomena which indicated a deep disturbance of the nervous system. A stage of excitation, followed by a comatose condition, blindness, loss of pain-sensations, convulsions, etc. Experimental observations showed that a direct connection could be traced between these attacks and the nature of the food. Their conclusion is expressed as follows: Dogs with a fistula between the inferior cava and portal vein cannot eat meat without suffering serious disturbances of the nervous system, often ending in death. Chemical examination of the urine showed the presence of carbamic acid, and it was suggested that the presence of this in the blood was the cause of the nervous symptoms. Carbamate of sodium or calcium was injected into the blood of normal dogs, and brought on a train of symptoms similar to those observed in the dogs operated upon. Moreover, carbamates given to normal dogs by the stomach had no injurious action; but when given to the dogs upon which a fistula had been made, they caused symptoms similar to those caused by the eating of meat,—namely, somnolence and ataxia; then excitation, loss of vision, and anæsthesia. From these facts they are led to conclude that one of the functions of the liver is to change the carbamic acid present in the blood into urea.

Histological examination of the livers, as far as reported,

showed simply different degrees of simple atrophy, or in some cases strong fatty degeneration. In the chemical part of the paper, a description is given of the facts which led to the discovery of the carbamic acid in the urine of the operated animals. Actual experiments showed, also, that when sodium carbamate was given by the mouth to a normal animal none could be detected in the urine, but when given to an operated animal it was found in the urine, showing that it had escaped destruction in the body, in part at least. It seems certain, from all these experiments, that the liver can change carbamates to urea; but other organs may also have the same power. Dogs with a venous fistula and the liver-artery tied, or the liver almost entirely extirpated, still give urea in the urine; and von Schroeder has recently shown that dog-fish may live for seventy hours after complete extirpation of the liver, without losing the urea contents of the muscles. But, granting that the liver forms its urea from ammonium carbamate, where is this latter compound formed? The authors believe that it is brought to the liver chiefly through the hepatic arteries, and is formed in the tissues at large wherever the oxidation of nitrogenous organic material takes place in an alkaline liquid. Through the portal veins only so much carbamic acid is brought as comes from the spleen, pancreas, and intestinal glands; and this quantity would be greater, of course, during the digestive processes. It is a little difficult to understand, however, why, under this last hypothesis, the carbamic-acid poisoning in the dogs with venous fistulæ should have been so much more pronounced after the eating of meat.

Closure of Bile-Duct and Thoracic Duct.—Harley¹⁸²_{May 25} has performed the interesting operation of closing the bile-duct and thoracic duct. In some cases the two were ligated at one time and in others the bile-duct was first shut and subsequently the thoracic duct. It had been shown by previous experimenters that when the bile-duct alone is closed the bile passes into the lymph-vessels of the liver and thence into the thoracic duct. Harley attempted first to determine whether after ligation of both ducts the bile acids and salts could be detected in the blood or urine. His results were variable; in some animals no bile could be detected in the urine for a number of days, in others it was found within a few days. In these latter cases it may have been that some new

connection between the lymph- and blood- vessels had been formed. Chemical examination of the bile in the ligated bile-ducts some days after the operation, when compared with that of normal bile, showed that the former contained more of some elements, *e.g.*, mucin, and less of others, *e.g.*, taurocholic acid. Distinct morphological changes could be detected in the liver-lobules, especially as the result of the stoppage of the normal bile-flow; the blood- and lymph- spaces were enlarged and the liver-cells were much reduced in size. The animals lived as long as seventeen days after the operation, without showing any disturbance in health.

Von Noorden¹⁸²_{May 25} communicates a number of interesting experiments, carried out with the help of his pupils, bearing upon important practical points in human nutrition. Kayser made upon himself certain experiments to determine whether fats can replace carbohydrates as protectors of proteids in the ratio of their heat equivalents. He got himself into N-equilibrium on a mixed diet, and then replaced the 340 grammes (11 ounces) of carbohydrate in this diet by the isodynamic equivalent in fat. The result was that the body lost nitrogen, the amount increasing each day (2 to 5 grammes—31 to 77½ grains). Upon replacing the carbohydrate N-equilibrium was again restored. It is not stated, in the brief account of the work, whether or not the fat was all digested and absorbed. He thinks that his experiments emphasize the peculiar nutritive value of the carbohydrates in protecting the proteids from consumption. As a second theoretical conclusion he believes that in diabetes it may be injurious to cut off the carbohydrates too completely, since a certain proportion is necessary to prevent proteid loss. As he puts it, azoturia is more dangerous than glycosuria. The second paper, by Krug, deals with the question of the storage of proteid when proteid is eaten in excess. A mixed diet was taken, rather more than sufficient to hold him in N-equilibrium for six days. This diet was then increased during fifteen days, by 1700 calories, by the use of additional fat and carbohydrate. The result was a storage calculated as equal to 1455 grammes (46½ ounces) of muscle and 2606 grammes (83¼ ounces) of fat, but a storage of flesh is not possible for a long-continued diet. It takes place chiefly (1) in the body during growth; (2) in the body which has reached its full growth, but is undergoing increased work; (3) when the body has, on account of sickness or

other causes, previously suffered a loss in flesh. The third paper is by Dapper, and treats of the loss of proteid in the case of obesity diets. He shows that it is possible, in persons inclined to obesity, to reduce the fat of the body by lowering the fats and carbohydrates in the diet, while at the same time preventing proteid loss or even bringing about a slight proteid gain. The explanation seems to be that the oxidation of the excess of body-fat under such a diet protects the proteid from loss if the diet is properly adjusted.

Proteid Metabolism in Man during the First Hunger Days.—Prausnitz³⁹¹_{v.11, No.2} adds a fairly complete set of experiments to the few observations of this kind previously recorded, increasing their value still further by extending the period of starvation over sixty hours. His method consisted in determining the N of the urine by the Schneider-Seegen method, not only during the period of abstinence, but also one or two days before, whenever this was possible. The individuals selected for these experiments were, with one exception, professional men, who fully appreciated, and could, therefore, be trusted to observe, all the conditions of the experiment. They were allowed nothing but water containing some CO₂, and in several cases a little alcohol, but were able in all but one case to pursue their ordinary occupations. Their ages lay between 20 and 34 years, and they were so selected as to show a wide range of size and weight.

The most interesting result brought out by the paper is the fact that the N-excretion in man, unlike in the dog, is greater on the second day of starvation than on the first. Man takes, relatively, large quantities of fat and carbohydrate in his diet, and so stores up fat, and especially glycogen, while the circulating proteid remains at a low level. These non-nitrogenous substances protect the proteid from oxidation, and the N-excretion does not reach its maximum and characteristic figure until the glycogen is consumed, *i.e.*, on the second day. Of the three exceptional cases which the author noted, two consisted of weak individuals who had taken a rich proteid meal, whereby the N-excreta of the first day was decidedly increased by the large amount of circulating albumen, while the third was an individual normally consuming very little proteid and a great excess of carbohydrate. In this person the author supposes the glycogen to have been sufficient to exert its

protective influence over two days, and the amount of N excreted would probably have risen on the third day. The figures also show that proteid metabolism increases with body-weight, without, however, being directly proportional to it, since it depends on the composition as well as on the weight of the organs. Thus, in fat persons the N excreted per 100 kilogrammes (200 pounds) is less than in lean persons who forego the protective influence of the fat.

In regard to the prevalent belief that starvation is painful the author concludes that it is entirely unfounded in fact. In the present series of experiments, one person was obliged to interrupt his fast at the end of forty-four hours on account of faintness, and another complained of nervousness for several days after; with these exceptions, no disturbances of the general health were observed, nor any special disturbances, such as pains or pressure at the stomach or bowels. Voit has made the same observation on dogs which would bark at feeding-time on the first hunger day, but afterward remained quietly in their cages or followed briskly when taken for a walk. The ordinary dread of hunger is attributed to the depressing psychical effect of the unfortunate circumstances which generally necessitate it.

MISCELLANEOUS.

The Secretion of Urine.—Luter and Mayer²⁷³_{v.32,p.241} report some very interesting and valuable observations upon a boy 5 years old, with ectopia of the bladder, in which the orifices of the ureters were fully exposed. The boy was kept quiet in a sitting posture for three and one-half days by means of a plaster-of-Paris bath, and during this entire period the urine was collected separately from the two ureters. They determined the total quantity of urine secreted from each side, the relative acidity, the amount of urea and of phosphoric acid. The total quantity of urine from the two sides was 1787.25 cubic centimetres, and was about equally divided between the two sides. They record that the secretion was not continuous, but intermittent. The amount of urea and of phosphoric acid was also substantially the same on the two sides. The acidity, however, differed, being constantly greater in the urine from the right kidney. The curve of secretion was mapped out for the entire period, and showed certain differences for the different days. In general, the amount of secretion increased from

6 A.M., the time of awakening, and reached its maximum in some cases in the morning and in others in the afternoon or evening, from which it sank to a minimum somewhere between 3 A.M. and 6 A.M. The curves were not at all regular. The awakening of the child during the night, when the secretion was low, was not attended in every case by a perceptible increase in the rate of secretion.

Peptone.—Pekelharing²⁶⁵_{B.7, H.2} has discovered a new reagent in trichloroacetic acid for separating from so-called pure peptone, prepared according to Kühne's latest directions, a substance which has all the properties of an albumose, and is, therefore, as strongly convinced as ever that the word "peptone" does not correspond to a definite chemical compound, but to a mixture of substances, with albumose among the number. His method is as follows: Digested fibrin is saturated with ammonium sulphate at the boiling temperature, first in neutral, then successively in alkaline and acid solution, so that a filtrate is finally obtained which remains clear on saturation with ammonium sulphate in the presence of any amount of ammonia or acetic acid. This filtrate should contain pure amphi-peptone, according to Kühne. Treating this solution with a mixture of 5 cubic centimetres of a saturated solution of trichloroacetic acid and 100 cubic centimetres of saturated solution of ammonium sulphate gives a copious precipitate, which, on stirring, clings in part to the rod and to the sides of the beaker in the form of adhesive clumps, and under the microscope is seen to consist of minute refractive globules. This precipitate is dissolved in water and saturated with ammonium sulphate; this gives a distinct cloudiness in presence of acid, which only partially disappears on neutralizing or in excess of alkali. When precipitated a second time and redissolved, a solution is obtained which has all the properties or reactions attributed by Kühne to albumose, and this substance was obtained from a solution which, according to the latter, should contain only amphi-peptone. The same result is obtained when the so-called pure peptone solution was previously rid of the ammonium sulphate according to Kühne's latest directions. To make sure that he was not dealing with that peculiar albumose described by Neumeister as arising from proto-albumose, and said by Kühne not to be completely precipitated by ammonium sulphate even

in presence of alkali, the author repeated the experiment on a solution obtained by digesting hetero-albumose, which he prepared free from proto-albumose from Witte's peptone. The result was exactly the same: trichloroacetic acid gave a good precipitate. When this reagent is added until no further precipitate is formed, the filtrate is still found to give a distinct biuret reaction. This, according to Pekelharing, is due to some albumose still remaining in solution by virtue of the presence of other products of digestion which render its precipitation difficult. In pure solution albumose is completely precipitated by saturation with ammonium sulphate; but when impure,—that is to say, in the presence of these other products of digestion,—the precipitation is incomplete. These impurities account for the differences in chemical composition and physical properties which Kühne finds between albumose and peptone, and no good reason remains for assuming the existence of the latter substance.

Lymph Secretion.—It has been shown by Heidenhain that peptone, when injected into the circulation, has the power of largely increasing the flow of lymph. E. H. Starling¹⁷⁸_{v.14,p.131} has made some experiments to determine whether this increased flow of lymph was a direct effect of the peptone or whether it resulted from the changes produced by the peptone in the blood. Since it is generally accepted that peptone rapidly disappears from the circulating blood when injected, it occurred to the author that this question might be decided by injecting peptonized blood into an animal and determining the effect on the flow of lymph from the thoracic duct. As a control experiment, it was first shown that neither blood-serum nor oxalate-blood produced any great or permanent increase in the flow of lymph, nor did they alter the coagulability of the blood of the receiving animal.

Peptone-blood, on the other hand, when injected into the veins or arteries, directly or indirectly, and with all necessary precautions to avoid interference with the normal lymph secretions (such as back-pressure on the large veins), always had a more-marked effect on the flow of lymph, and in several cases this influence was considerable. It happened, however, that the effect on the lymph was entirely independent of the effect of the peptone on the blood; that is to say, cases in which the coagulability of the blood was not destroyed often gave the most-abundant lymph

secretion. Such a result suggests that the transfused blood still contained sufficient peptone to account for the effect on the lymph, and that it did not disappear from the circulation as quickly as it is ordinarily supposed to do. Actual analysis of the peptone-blood showed that this was the case, and peptone was found from one to two hours after its injection. His method consists in precipitating the total proteids of the plasma with an equal bulk of a 10-per-cent. solution of trichloroacetic acid, and applying the biuret test to 10 cubic centimetres of the clear filtrate, using 1 cubic centimetre of saturated caustic potash, and adding a very dilute solution of copper sulphate, drop by drop. The quantitative estimation is made by diluting the filtrate, treated as above, until its tint is exactly the same as that obtained with a solution of peptone of known strength. This method enables the author to detect peptone in plasma containing 0.005 per cent. It was found that the shortest time at which there was a total disappearance of peptone was fifty minutes. Moreover, when he injected 0.3 to 0.5 gramme (4.6 to 7.7½ grains) per kilogramme (2 pounds) of body-weight, the blood contained 0.2 to 0.36 per cent. of peptone ten minutes after the injection, and 0.04 per cent. seventy minutes after the injection. Parallel determinations of the peptone in the blood and lymph gave the following result:—

2 minutes after injection blood contained 0.48 per cent. peptone.							
2	"	"	"	lymph	"	0.24	"
10	"	"	"	blood	"	0.36	"
10	"	"	"	lymph	"	0.36	"
20	"	"	"	blood	"	0.18	"
20	"	"	"	lymph	"	0.30	"
50	"	"	"	blood	"	0.10	"
50	"	"	"	lymph	"	0.18	"

As in the case of sugar as determined by Heidenhain, so here there is a passage of peptone from plasma containing less to lymph containing more, and this can only be explained on the assumption of an active secretive intervention of the endothelial cells. Three experiments in which the renal vessels were ligated before the injection of peptone gave a somewhat different result. In these cases the peptone in the blood sank exactly as before, but the lymph never contained more peptone than the blood, indicating that the endothelium of the renal capillaries may play a large part in the secretion of the peptone.

As to the proposed question whether the effect on the lymph secretion of injections of peptone-blood is direct or indirect, the author concludes that the peptone exercises a direct excitatory effect on the endothelial cells, the amount of peptone present in the blood ten or fifteen minutes after its injection being quite sufficient to account for the lymphagogic effect produced by the transfused blood.

Removal of Spleen.—Dastre⁴¹⁰_{July} conceived the idea that, although removal of the spleen in adults has little or no injurious after-effect, the same operation performed upon very young animals might give a more distinct result, and thus throw light upon the functions of that organ. This supposition was based upon the well-known fact that thyroidectomy in young animals is more serious in its results than when performed upon the adult. Experiments made to test this hypothesis proved entirely negative. No difference in the growth or sexual characteristics of the animal could be detected.

Pancreatic Secretion.—Vassiliew¹¹⁰¹_{v.2, No.2} has succeeded in keeping dogs alive with a permanent pancreatic fistula by paying attention to the diet. It was found best to feed them upon milk and bread rather than upon a carnivorous diet. The digestive action of the secretion, with reference to proteids and starches, seemed to vary with the nature of the food: a carnivorous diet increased the proteolytic action of the secretion, while a diet of milk and bread increased its amylolytic action.

Removal of the Gall-Bladder.—As the removal of the gall-bladder is an actual occurrence in surgical practice, Rosenberg²⁴⁶_{Jan.5} has investigated, upon dogs, the influence of this operation on the digestion of proteids and fats. From the results of his experiments it seems that the absence of the gall-bladder makes no perceptible difference in the digestion and absorption of either fats or proteids. He obtained post-mortem evidence that, in his animal, the flow of bile was continuous, and not intermittent.

Thyroidectomy.—Christiani⁴¹⁰_{p.39} has shown that thyroidectomy in the rat is followed by death within one to three days in nearly all cases. In the four cases which survived the operation subsequent dissection showed that a remnant of the gland had been left and had afterward developed, thus explaining the recovery of the animal. If one of the removed glands was transplanted to

the peritoneal cavity, the evil effects of extirpation were mitigated and the animal escaped a fatal result. Histological examination in these latter cases proved that the gland had made a good graft and established a new circulation. In the animals in which this grafting had taken place the author found that subsequent removal of the transplanted gland was not followed by a fatal result, as might have been anticipated, and this he explains by supposing that during the interim some other organ had been given an opportunity to assume the functions of the thyroid. In a second paper ⁴¹⁰_{p.164} Christiani gives a detailed description of the anatomical relations of the thyroid in the rat; he records the interesting fact that in this animal the accessory thyroid discovered by Sandström is contained within the thyroid itself, in an undeveloped condition, whence the greater certainty of a fatal result from thyroidectomy in these animals as compared with rabbits.

Iris Movements.—The mechanism of the movements of the iris seems to be a topic of ever-increasing interest among physiologists, although it now seems almost certain that the final solution of the problem must eventually be furnished by the histologists. Two papers, representing almost diametrically opposite views, recently appeared at nearly the same time. Grünhagen ²⁴⁶_{v.53,p.348} once more defines his position by a defense of the following fundamental principles: 1. The ordinary variations in the size of the pupil depend almost exclusively on the condition of a single muscle, the sphincter, and the force by which the pupil is dilated during the relaxations of the sphincter resides chiefly in the elasticity of the tissues composing the ciliary zone of the iris, and to a slight extent only is due to the contraction of the muscle-fibres of the blood-vessels of the iris. 2. Dilatation produced by stimulation of the sympathetic results from two factors: contraction of the blood-vessels and inhibition of the sphincter muscle.

In support of the first statement he adduces the following facts: 1. The range of variation in the pupil is not restricted by extirpation of the superior cervical ganglion. 2. Paralysis of all the nerves of the iris by cocaine or atropine injected into the anterior chamber gives a maximal enlargement of the pupil, the eye being kept at body-temperature, and likewise maximal mydriasis supervenes after death, as seen in cats at ordinary temperatures, in rabbits only after overcoming the contracture of the

sphincter by raising the temperature to 38° C. (100.4° F.),—a limit below which the tension of the ciliary zone is not affected by temperature changes.

That sympathetic dilatation is to be explained as above is deduced from the following facts: 1. There is no anatomical evidence for a dilator muscle. 2. Bernstein's results, which were obtained by passing an electric current through the iris in different directions, and which have been interpreted in favor of the existence of a dilator muscle, cannot be obtained when the superior cervical ganglion is extirpated four or five days before the experiment. This modified form of the experiment, in fact, actually disproves the theory of a dilator muscle, which, if present, would respond equally well to direct stimulation after degeneration of its nerves, and shows that Bernstein stimulated nerve-fibres, and not muscle-fibres.

The contractility of the ciliary zone, which Kölliker and Hurwitz found persisted after excision of the sphincter, and the response of this zone to direct stimulation, or to stimulation of the cervical sympathetic, result partly from the presence of the vasomotor fibres of the iris in the sympathetic. Under their influence both radial and circular blood-vessels become constricted, and by pulling on the intermediate tissues tend to draw the free pupillary margin nearer to the ciliary margin,—a process which is still further assisted by the shortening of the radial vessels resulting from the spiral arrangement of their muscle-fibres. This theory is in accord with the fact that in normal movements of the iris a very slight rôle is to be attributed to active dilatation. It also explains failure of Bernstein's experiment after degeneration of the nerves of the iris. The fact that sympathetic stimulation still brings about dilation after death or in the bloodless iris is no objection to the theory, since the result depends simply on active contractions of the muscles of the vessels independent entirely of their contents. The observations on the time-relations between the dilation of the pupil and the constriction of the vessels have also failed to develop a serious difficulty. Arlt's observations on the rabbit are entirely negated by the author's own work, and François Franck admits that the synchronism of the two processes is only missed with weak stimuli.

Finally, the fact that the long ciliary nerves may produce

dilation without a concomitant change in the blood-vessels the author explains by a second set of fibres going to the iris in the cervical sympathetic,—the “inhibitory” fibres of the sphincter. The author admits that this is the weakest point in his theory, but bases his belief in the existence of these inhibitory fibres, among other things, on these facts: The active elongation of the sphincter on tetanic electric stimulation; the existence of eyes (sheep, ox) in which the ciliary portion of the iris is entirely devoid of radial contractility, but in which the sympathetic is still able to bring about dilation.

Langley and Anderson ¹⁷⁸_{v.13,p.564} give an excellent critical review of all the evidence which has been adduced either for or against the existence of a dilator muscle, and show that this evidence in all cases is inconclusive. This part of the paper is extremely interesting, as it takes up the experiments of Bernstein, Jegorow, and Kölliker, which have been urged in favor of a dilator muscle, as well as those of Samkow, Grünhagen, and Budge on the other side of the question; as it does not admit of a brief abstract, the reader is referred to the original.

As the results of Budge and Waller, and more recently of François Franck, clearly prove that the condition of the pupil is independent of the degree of turgescence of the iridic blood-vessels, the author next takes up the question of the influence of the contraction of the vessels without reference to their contents. He finds that the vaso-constrictor fibres of these vessels arise with the dilator fibres of the pupil; but direct observation of the vessels and of the pupil under various conditions shows that there must be two distinct sets of fibres, that the vascular constriction and dilation of the pupil do not stand in a causal relation. For instance, either during sympathetic stimulation or after atropine injections, when the pupil dilates, it is seen that the sinuosity of the radial vessels of the iris is markedly increased; that there is a decided lack of synchronism between the processes, the pupil reaching its maximal dilation before the constriction of the vessels begins; lastly, the action of the sympathetic on the size of the pupil could be almost abolished, while its stimulation still gave complete constriction of the vessels. In another series of experiments the authors prove that the sympathetic does not produce the dilation of the pupil by inhibition of the ciliary muscle,—an

effect which Morat and Doyon claimed to have observed in dogs, cats, and rabbits.

The most important part of the paper is perhaps that which now follows, in which Langley and Anderson bring forward evidence to show that an increase in radial tension, together with a shortening, can be produced in any given radial strip of the iris. As such a change cannot be due to a contraction or relaxation of the sphincter, the only possible explanation is that there is a contractile substance radially disposed in the iris, which by its contraction leads to a dilation of the pupil. The nature of this contractile substance the authors promise to discuss in a later paper, their histological work not justifying them in regarding it as involuntary muscle.

This evidence is found in the following observations: 1. When local dilation, obtained by stimulation of the sclerotic, or by stimulation of the cervical sympathetic after cutting all the long ciliary nerves but one, passes a certain limit, the opposite side of the iris is dragged toward the stimulated side. 2. This local dilation is not produced by an inhibition of the sphincter muscle, for the sphincter can be made to contract locally at the same time, its contraction being greatest at the most dilated portion of the pupil. This result is obtained by the use of strong currents applied to the edge of the sclerotic, and is manifested by foldings observed on the anterior surface of the iris. These folds fall into two groups,—a group of circular folds due to the contraction of the radial contractile substance (these alone appear when the local dilation is obtained by Jegorow's method) and a group of radial folds produced by the contraction of the sphincter. 3. Stimulation of the sympathetic causes shortening of a radial strip of the iris, and this shortening may be obtained before or without any contraction of the blood-vessels in it, these being observed under the microscope during stimulation; the microscope also reveals small waves of contraction on the posterior surface. Finally, it is shown that the iris contains no elastic tissue, and that the sympathetic exerts no inhibitory influence on the sphincter. If an eye be left in the body two or more days, when involuntary muscle has lost its contractility, no retraction of the ciliary portion of the iris is observed on removing the sphincter, indicating the absence of elastic tissue. Radial strips of the iris, also, if gently stretched and held so for a

minute or so, will remain extended for a time instead of retracting at once, as stretched elastic tissue would; but, on stimulating it, it retracts at once. No elongation of the contracted segment of the sphincter forming the inner edge of radial strips can be detected on stimulation of the sympathetic; nor could it be demonstrated by fixing one end of half the sphincter while the other end was connected with a lever by means of a silk thread.

NORMAL HISTOLOGY AND MICROSCOPICAL TECHNOLOGY.

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HISTOLOGY.

Brain.—S. Ramón y Cajal, of Madrid, ^{401 277}_{V.56; Jan., '94}, after a detailed description of the microscopical anatomy of the cornu ammonis, fascia dentata, or subiculum according to Golgi's method, reaches the following conclusions: 1. The cornu ammonis represents a portion of the brain-cortex, but of a more complicated character in its superficial layers, simpler in its deeper layers. 2. The molecular layer of the cornu ammonis is richer in cell-elements than is the cortex, for, in addition to the cells of Golgi's second type, there are certain triangular corpuscles and spindle-shaped cells. 3. As in the cortex, the nerve-processes from the cornu ammonis are association, projection, and commissural fibres. 4. Although the fascia dentata corresponds in essential features with the cornu ammonis, it yet possesses certain characteristics, the chief of which are that the axis-cylinder processes of the granules present mossy thickenings and circumcellular tufts in the layer of pyramidal cells. 5. The association cells of the cornu ammonis and fascia dentata are divided into three kinds: large pyramidal cells with short branches; spindle and triangular cells with longer axis-cylinders, which end in large branched tufts; and irregular cells with very short nerve-branches, which anastomose with neighboring protoplasmic terminals. 6. A point of general interest consists in the fact that, while the bodies of cells with long axis-cylinder processes, such as are found in the cerebral cortex, Purkinje's cells of the cerebellum, and the anterior-horn cells of the spinal cord, are embraced by thick end-tufts of collaterals and nerve-fibres, the cells of Golgi's second type, with short nerve-processes, never possess clear circumcellular envelopes.

Schaffer ^{29 126}_{V.39, No.4; July 15} states that the following layers may be
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distinguished in the hippocampus major: 1. Alveus. 2. Layer of polymorphous cells: (a) fusiform; (b) polygonal. 3. Layer of large and (4) of small pyramidal cells. 5. Layer containing but few cells: spherical or fusiform elements. If we compare this structure with that of the cerebral cortex (Ramón y Cajal), it will be found that a complete analogy exists between the two, the only difference being that in the hippocampus major the two layers of pyramidal cells are, in a measure, united, the smaller cells having penetrated into the larger. It might be said that the hippocampus major is a cortical zone of typical structure, but compressed. Considered separately, the cellular types are the same as those of the cortex described by Ramón y Cajal. Schaffer, however, was unable to find cells with several prolongations of the axis-cylinder. He observed collaterals forming such prolongations from pyramidal cells. Finally, he observed, in the layer of polymorphous cells, elements belonging to Golgi's Type II (so-called sensitive). These researches were made upon young rabbits and newborn pigs, by the methods of Golgi, Weigert, and Nissl.

The arterial circulation of the cerebral peduncle was studied by Alezais and Désstras,¹⁶⁵_{Sept., '92} who believe that the arteries nourishing the peduncle may be divided into five groups: 1. *Internal peduncular arteries*, which, arising principally in the ascending portion of the posterior cerebral artery, penetrate into the internal portion of the peduncle, but do not extend beyond the black substance, seeming destined solely for the lower stratum. 2. *Arteries of the nuclei of the third pair*, originating in the posterior cerebral and forming an independent system, which extends, fan-like, into the gray nuclei of the common oculo-motor. 3. *Peduncular antero-external arteries*, the most irregular and the most numerous, fed by the superior and posterior cerebral, and some few of which extend to the optic sheath. 4. *Superior peduncular arteries*, rather rare, having the same origin as the preceding. 5. *Arteries of the tuberculi quadrigemini*, represented on each side by a special vessel, called the twin peduncal artery, arising from the posterior cerebral very high up. The tuberculi quadrigemini are the most highly vascularized portion of the peduncle, but, with their exception and the gray nuclei of the third and of the fifth pair, the upper stratum is furnished with a smaller number of nourishing arteries than the lower.

Vas,²⁹_{v.40, No.3} in a study of the chromatin in the cells of sympathetic ganglia, shows that the separation of this substance follows a well-determined and unchanging type. It increases correspondingly with the growth of the organism and with the development of the ganglion cells. It bears no relation to the pigment found in the ganglion cells in certain races after a certain period; the pigment in question has no especial significance, and bears no especial relation to cellular regression.

Vas also examined the condition of the ganglion cells in the rabbit after excitation of the sympathetic cord by an induction current. The nucleus was then found to be much larger than in the normal state, and—most remarkable feature—it left its position in the centre of the cell and approached the periphery. In many cases this migration was so pronounced that the cellular contour was raised by the nucleus, which had a tendency to cause a hernia. Nuclei were, however, never found free outside of the cell. The cellular tissue itself was augmented in volume, and its chromatic substance was also pushed against the periphery. It is probable that in the physiological state these transformations are not so accentuated.

G. Retzius⁶⁷³_{May} discovered, in the cortical substance of the brain proper of a human foetus 8 months of age, a very strange species of cells, which send their filaments in different directions. From these prolongations, which resemble garlands, smaller ramifications spread more or less vertically toward the surface of the cortex of the cerebrum, where they terminate in button-like thickenings. It is Retzius's opinion that these cells in the human brain-cortex belong to the same species as those discovered by Ramón y Cajal, in the brain of the rabbit,—i.e., polygonal and fusiform cells,—although in man, at least during the foetal period, they are much more developed and show a peculiar form. The author is persuaded that they are true nervous elements, although he cannot furnish a scientific proof for this allegation. (Report of Corr. Editor Eklund, Stockholm.)

Spinal Cord.—Mingazzini,⁵⁹¹_{v.18, Nos.3,4}; ⁸⁶⁶_{Mar., June} reports the results of the examination of over one thousand sections of the spinal cord in a case of amyotrophic lateral sclerosis, prepared according to the newer method of Golgi, which he discusses in comparison with the data previously obtained. The atrophy of the muscles in the

patient, two months before death, involved more or less completely the arms, legs, back, and face, and to a considerable extent those of the neck. The abdominal muscles and diaphragm were uninvolved and the sphincters functioned normally. The knee-reflex was exaggerated, foot-clonus present, cutaneous reflexes normal; there was exaggerated fibrillary excitability in the muscles that were intact. Pupillary reactions normal; special senses generally intact, except hearing, which was slightly impaired. Speech slightly impaired as to the pronunciation of guttural and dental sounds; deglutition difficult. Temperature slightly elevated; pulse 96, small. Examination of sections of the lower lumbar cord revealed complete degeneration on both sides of a triangular space corresponding to the crossed pyramidal bundles, while the other regions were intact. In the middle and upper portions of the lumbar regions the same tract was involved and the anterior horns were in part affected, many of their cells lacking, others without their prolongations, and still others shrunken. With carmine coloring they were of a uniform, clear, rosy tint, the nucleus undistinguishable. The nervous net-work of the gray substance, as compared with the normal condition, seemed rather less rich in the fibres that ordinarily are found around the antero-lateral group of the cells of the anterior horn. In the dorsal segment of the cord the same degeneration of the pyramidal bundles was observed; the cells of Clark's columns and those of the posterior horns and the posterior root-fibres were intact, while the anterior horns were notably and uniformly diminished in sections on both sides. In the anterior horns the nervous net-work was apparently destroyed, the cells reduced to a very few, and those remaining reduced in size and with undistinguishable nuclei; the anterior root-fibres partially atrophied. In the cervical cord the same degeneration of the pyramidal fibres was observed. In the middle of the fundamental fibres of the anterior and the lateral columns there were vacant spaces corresponding to those occupied by the anterior radicular fibres; these bundles showed, in some points, an incipient but very limited rarefaction. The size of the anterior horns was very much reduced, and all the cells in the median, ventro-lateral, and postero-lateral groups had disappeared. In the whole field of the anterior horn (except in its median portion), and also in the lateral horn, the fibres of the nervous net-work were

completely gone, so that this part appeared structureless; only short fibres interwoven into a very loose net-work occupied the median portion of the anterior horn. Some fibres of the anterior commissure had disappeared, and, comparing this commissure with that of the normal adult at the same altitude, it was observed that the fibres that bend ventrally along the median margin of the anterior horn are preserved only in part. Nevertheless, it was possible to distinguish fairly well two orders of fibres; the ones forming a very minute fascicle (ventral portion) bending toward the anterior horn and there becoming lost, or penetrating the fundamental bundle; the others forming a thicker bundle (dorsal portion) turning dorsally, and in some preparations distinctly visible in their continuation with fasciculi belonging to the median bundle of the posterior radicular fibres. From the bundles appertaining to the remainder of the lateral column were seen to proceed a compact fascicle of fibres, which, traversing the clear field of the base of the anterior horn, continued in the direction of the fibres of the anterior commissure. The course of the posterior radicular fibres could be followed with sufficient exactness; the lateral bundles could be seen to lose themselves in the net-work of fibres behind the anterior portion of the gelatinous substance; from this net-work proceed very minute fibres, which, thinning out, pass toward the base or toward the centre of the anterior horn, where they were lost to view. Both the net-work and the fine fibres originating from it can be traced across the median bundle of the posterior root-fibres, which pass obliquely outward in a lateral direction, and there thinning out lose themselves, like the others, in the base of the anterior horn. In some well-stained sections the terminal ramifications could be seen pushing farther toward the lateral part of the cornua. In some sections it was observed that the more ventral fibres of the median bundles bend inward and pass on with the more dorsal fibres of the anterior commissure. In the discussion of the observations above described the author reviews the literature of the theories of the connection between the anterior roots and the pyramidal tracts,—that is, the connections of the cerebro-spinal and spino-muscular systems. Since the discovery by Golgi of the presence of collateral fibres from the anterior and lateral columns to the net-work in the gray substance, and of fibres from the cells of the anterior horns

to the same, it has been admitted hypothetically that the connection between the great multipolar cells of the anterior cornua and the pyramidal fibres is effected by these. Mingazzini believes that his observations, while not affording an exact anatomical demonstration of this connection, yet go far to show in what portion of the nervous net-work it is effected. The gradual disappearance from below upward of the nervous net-work and the cells of the anterior horns, together with the complete degeneration of the pyramidal columns, indicate that the same morbid process must affect them both, and presumably the columns first. The net-work of the anterior horn cannot, according to the data of histology, be considered as formed by the terminal ramifications of the collateral fibres of the pyramidal columns; and since these ramifications appertain to the distal portion of the cerebro-spinal system, while the cells of the anterior horns belong to the spino-muscular, the affirmation is justified that the nervous net-work of the anterior (and lateral) cornua represents almost in total (except in its more central portion) the intermediary system between these two systems. The view of Gowers that the degenerative process simultaneously affects both in amyotrophic lateral sclerosis is not supported by the fact of the progressive disappearance of the cells while the lateral columns are degenerated throughout, as is here pointed out. The functions of the different groups of the cells of the anterior cornua, especially the postero-lateral group, are discussed at length, and the literature of the subject is gone over quite fully. Mingazzini adopts, in the main, the view expressed by Kölliker and Ramón y Cajal, who explain spinal reflex action by the intervention of the antero-posterior or sensori-motor collateral fibres discovered by them, and also adopts, with slight modification, the *schema* of Waldeyer, by which this mechanism is explained. The bearings of his investigations on the question of the structure of the anterior commissure are also discussed, and his conclusions in regard to the whole are summed up as follows: 1. That the nervous net-work (*intreccia*) of the anterior horn (except in its median portion) is formed almost entirely from the terminal fibrils (collaterals from the pyramidal bundles) that maintain in relation the cerebro-spinal with the musculo-spinal segments of the pyramidal route. 2. That all the groups of cells of the anterior (and lateral) horn have motor functions; but the medial and ventro-lateral groups are in direct

relation only with the collaterals from the pyramidal fibres, while the postero-lateral group is in relation not only with these, but also with the terminal extremities of the sensory collaterals from the posterior radicular fibres which push with their terminal extremities as far as the base of the anterior horn. 3. That the anterior commissure is formed of two parts,—a dorsal portion formed by the crossing of a part of the posterior radicular fibres, and a ventral portion formed in part, at least, by the prolongations of the cells of the anterior horns and of the anterior radicular fibres.

Sherrington^{1006 2081}_{Mar.; V. 52, p. 318} has given an interesting account of his experimental attempt to determine the segmental relations between the several areas of distribution of the sensory roots. The field of skin belonging to each sensory spinal root he terms the segmental skin-field. Although in a plexus each posterior spinal root gives separate contributions to many nerve-trunks, the cutaneous distribution of the root is composed of patches so joined that the distribution of the entire root forms one continuous field. Each segmental skin-field, however, spreads over adjacent ones, so that each region of the body is supplied by at least two dorsal roots. The unmodified shape of a skin-field is band-like (as in the thorax or neck), wrapping around the sides of the body. In the limb these areas are greatly distorted and apparently dislocated. The mid-dorsal line of the body may be said to be folded laterally at the origin of the limbs, as is also the ventral region. Upon these axes the cutaneous segments are arranged. The edges of the foot and hand are in the segmental fields of the limb about midway between the mid-dorsal and mid-ventral lines, and, accordingly, correspond to the lateral line of the trunk from which the digits are buds. Vulva, anus, and umbilicus lie in the mid-ventral line. The nipple is in the fourth thoracic field. Six segments (third to eighth cervical) contribute to the anterior aspect of the fore limb; the first to fourth thoracic contribute to the posterior part. The first to sixth post-thoracic segments supply the anterior aspect of the hind limb and the sixth to the ninth posterior aspect. The joints do not correspond to segmental limitations. The segmental law, rather than functional co-ordination, is the basis of distribution. Peyer's statement of the correspondence of locality of the muscular and cutaneous distributions of a spinal nerve does not apply to the monkey.

Tanzi ^{591 996}_{p.273; Dec.25} states that at any age the anterior spinal roots of the cat, and particularly the lumbar roots, contain cells similar in aspect to those of the intervertebral ganglion. Their presence does not seem to be due to accidents of preparation; their number is small, each histological section containing but one, and some showing none at all. Their frequency does not sensibly diminish with age, at least not during extra-uterine life. In comparison to the cells of the spinal ganglion, they are of medium size, principally situated on the edge of the medulla; or near the origin of the nerve, either on the ganglion border or on the anterior edge of the root. Elongated and parallel with the longitudinal axis of the root, as a rule, they may, however, be found more or less transversal, circular, or oval. In rare cases, where the nerve-cells are united in twos or threes, they may be found in the direction of the anterior roots, where they have already become united with the nerve, or at the point of becoming so. The anterior root, furnished with one or more cells, was perfectly distinct and detached from the ganglion.

The author was unable to establish any relation between the radicular fibres and these cells.

New ideas concerning the histology of the nervous centres are discussed by Ramón y Cajal, of Madrid, ¹⁴_{Sept.10,13,20,24,27,Oct.1,4} who deduces the following conclusions: 1. The most general opinion as to the morphology of the cells of the nervous centres is that there is absence of continuity of substance between the expansions of the nervous, epithelial, neuroglial corpuscles. The cellular nerve-elements represent true cellular units or *neurones*, as expressed by Waldeyer. 2. No continuity of substance existing, the currents must be transmitted from one cell to another by contiguity or by contact, as is the case in the contact of two telegraphic wires. This contact occurs between the terminal arborizations and the collaterals of the axis-cylinders, on the one hand, and the cellular bodies and the protoplasmic arborizations, on the other. When, as in the spongioblasts of the retina and in the unipolar cells of invertebrates, there is no protoplasmic expansion, the surface of the cellular body is the sole point of nerve arborizations. 3. The probable direction of nervous movement in the cells, having two modes of expansion, is cellulipetal in the protoplasmic prolongations and cellulifugal in the axis-cylinder. This latter movement

is that of the cells having only one kind of prolongation (spongio-blasts, etc.). The receptive or cellulipetal is here represented by the thin stratum of protoplasm surrounding the nucleus. 4. In the bipolar cells (auditory, olfactory, retinal, bipolar sensitives of worms, according to Lenhossék and Retzius; bipolar sensitives of the spinal ganglions of fish, etc.) the peripheral expansion is great, and must be considered as protoplasmic, since it is destined to reunite the currents (cellulipetal movement). In the unipolar cells of the spinal ganglions of batrachians, reptiles, birds, and mammals, the peripheral expansion of the single branch starting from the cell may be considered as a protoplasmic branch or an organ of cellulipetal transmission, and the more fixed central expansion as a nerve-fibre or an organ of cellulifugal transmission. The branch or stem containing the two expansions before their bifurcation does not exist during the embryonic period (His); it is formed later by absorption from the cellular body, and thus represents, by its morphology and genesis, a portion of the cellular body, and not a nerve-fibre. 5. The protoplasmic expansions do not represent, as stated by Golgi and his pupils, a simple nutritive apparatus, composed of a kind of small roots sucking up the plasma from the capillaries, but have the same conductive function as the axis-cylinders. The two facts advanced by Golgi in support of his paper, tendency of the protoplasmic expansions to group themselves about the vessels and their connection with the neuroglia, are not confirmed by the author, nor by Van Getruchten, Kölliker, Lenhossék, Retzius, Schaefer, etc. Besides the reasons given above against this opinion of Golgi, several others, of a certain importance, may be here given. The olfactory glomerules of the inferior vertebræ have neither vessels nor neuroglia, but, notwithstanding this, they are, as in the mammifera, the termination of the protoplasmic expansions of the mitral cells, etc. In the retina of the inferior vertebræ, the internal plexiform zone, point of reunion of the protoplasmic prolongations of the cells of the ganglionic layer, has no capillaries and neuroglial corpuscles, and, notwithstanding the absence of these, the well-known arrangement of these protoplasmic prolongations, as well as their connections with the bipolar cells, are in no way altered. The entire region of the gray substance, furnished with terminal nervous fibres, contains at the same time the proto-

plasmic arborizations; the contrary being also true, for there is no region in which protoplasmic expansions are found which is not also the seat of terminal nerve arborizations. The doubts expressed by Kölliker and several other authors on this point, citing as a contrary example the existence of protoplasmic expansions in the white substance of the brain and of the spinal cord (substances which contain nothing more than medullated fibres could not be the seat of cellular communications), lose their force, in the opinion of Cajal, since his own researches have proved that (*a*) the white substance of the spinal cord, as well as that of the brain, is a termination region of special collaterals; (*b*) these regions contain, or may contain, nerve-fibres without myeline, having the character of terminal ramuscles; (*c*) in those regions in which protoplasmic expansions seem to unite in an exclusive fashion (certain ramifications in the optic lobe of reptiles, batrachians, and fishes; the peripheral region of the spinal cord of reptiles, batrachians, and fishes, etc.) a considerable number of terminal nerve arborizations of nerve-fibrils without myeline occur. In these animals the protoplasmic expansions of the cellules of the anterior horn are of enormous length; after having formed irradiating fascicles extending through the white substance, they form around the latter—that is to say, under the pia mater—a very thick peri-medullar plexus, first noted by Cajal as existing in reptiles, afterward by Lavdowski in batrachians; Sala has recently made a careful study of these in the larval state. Within this plexus certain peripheral collaterals of tubes of the white substance and some few terminal fibres deprived of myeline end. Recently Cajal has also seen, in the most external zone of the lateral cord (embryonic cervical cord of the chicken, sixteen days), true fusiform nerve-cells, extending backward from the anterior portion, the ramificated expansions of which were in relation with the peripheral collaterals. 6. The extreme length of certain protoplasmic branches (pyramidal cells of the brain, Purkinje's cells, etc.), as well as the richness of the lateral and basilar protoplasmic expansions, would seem to be in relation with the number of nerve arborizations of which they are destined to receive the currents. The asperities and interspinal irregularities seen in many protoplasmic arborizations probably represent impression or contact points of terminal nerve-fibrils.

F. Baker ¹_{June 27} also furnishes a valuable *résumé* of recent dis-

coveries in the nervous system. Considerable attention is given to the histogenetic problems.

A. Dogiel, ²⁹_{V.41, No.1; July 15} ¹²⁶ having referred to the various opinions formerly advanced concerning the relations between the protoplasmic prolongations and the axis-cylinder prolongation, as well as to the well-known theory of Golgi, studies the mode of ramification of the protoplasmic prolongations, taking for this purpose the nerve-cells of the human retina, which he divides into three groups, each of which may again comprise several types. He shows, contrary to Golgi, that these prolongations anastomose from one cell to another, thus forming a net-work, while not taking on any direct connection with the vessels. The axis-cylinder originates either immediately from the cellular body, from one of the protoplasmic prolongations, from the web resulting from the union of the ramifications, or directly through the union of protoplasmic filaments in one fascicle (cells of the third group). The protoplasmic prolongations are incontestably of nervous nature. The author has also studied the structure of nerve-cells, by means of methylene blue. They are composed of fibrils and of interfibrillary substance. The fibrils are continuous, and extend from a protoplasmic into an axis-cylinder prolongation or *vice versâ*. The general conclusion is that the theory of Waldeyer, who considers each nerve-cell (with its prolongations) as separate and isolated,—a *neurone*,—is inexact. The nerve-cells form, in their entirety, a colony of which the members are united by numerous bands.

As regards the finer anatomy of the sympathetic ganglia, L. Sala ⁴⁰⁹_{V.18, No.8; Aug.15} ¹³ states that the researches made by him, by the method recommended by Ramón y Cajal, of repeated impregnation with nitrate of silver, have caused him to draw the following conclusions: The nerve-cells of the sympathetic are multipolar, with numerous varieties of protoplasmic prolongations, but only one single undivided nerve prolongation. In each sympathetic ganglion two different kinds of nerve-fibres exist: (1) undivided, varicose, wave-like extensions, reaching in all directions in more or less thick fascicles; (2) rather thicker fibres, non-varicose, with numerous fine collaterals, which again ramify considerably. They are less numerous than the first group, and are almost exclusively found in the branches connecting the sympathetic ganglion cells with

the cerebro-spinal system. Only those fibres remaining undivided are nerve prolongations of the sympathetic cells; while the others, forming collaterals, are considered by the author as most probably belonging to the cerebro-spinal system. Both groups of fibres form in the sympathetic ganglia a very fine net-work, filling up the spaces between the cells, and in close contact with them. The protoplasmic prolongations of the sympathetic nerve-cells do not take part in this net-work and do not give rise to any sympathetic fibres. Usually they become divided and separate, but the "nest-like" arrangement around the neighboring cells, described by Cajal as characteristic, is considered by the author to be purely accidental.

Eberth ³⁴_{Aug. 1} has studied the change of color in fish and amphibia, and the manner of its production. Although direct excitation of the chromatophere protoplasms by light has not yet been proven, their contraction, which is the cause of change of color, results in excitation of the pigment nerves. It has frequently been stated that nerves extend to the chromatophores, but nothing definite is yet known concerning their terminations. Eberth was able to observe the nerves of the chromatophores of fishes more fully than did his predecessors. He obtained the best results by bleaching the preparation secured by Golgi's method with lime-water, in order to remove the pigment of the chromatophores, and to obtain as clear a background as possible for the darkly-traced nerves. In this bleaching process the picture of the fine nerves is, unfortunately, also destroyed, as the chromate of silver, with which the nerves are impregnated, is transformed into chloride of silver. By illumination the former can, however, be again shown, the chromate of silver being transformed into metallic silver or some other combination. Such preparations represent the nerve-endings as thread-like ends attached to the chromatophores, which, in the case of the larger ones, seem to arise partly in a rich nerve net-work surrounding them, and to extend to the body of the chromatophore and its derivatives.

B. Segal ¹⁶⁵_{Sept} states that an impression showing only the cross-bar of the Latin cross may be produced in Ranvier's nodes by the more or less prolonged action of nitrate of silver. By the same process an impregnation may be produced in Schmidt-Lantermann's incisions,—that is, at the junction of the imbricated seg-

ments, a prominent superficial ring being marked by the deposit of silver, the cylindro-conical segment showing the impregnated ring, being always the one which receives the extremity of the neighboring segment. These rings are upon the surface of the nerve-tubes,—under the sheath of Schwann, it is true, but not between the cylindro-conical segments; they surround the myeline; strong impregnation may cause the rings to resemble pierced disks. These rings seem to play a rôle in the enarthrosis of the two neighboring segments.

J. E. Johansson ³²⁰_{Supp. p. 41, '92} refers to the ring-like bands of the nerve-fibres, and states that, upon hardening the nerves in a mixture of bichromate of potassium and sulphate of copper and coloring them with hæmatoxylin, he obtained, at the point of Lantermann's incisions, ring-like bands, which encircle the axis-cylinder, between two segments of the cord, in funnel shape, in such a fashion that its upper extremity surrounded the entire nerve-fibre, the lower edge, on the contrary, only encircling the axis-cylinder. With regard to the nature of these formations, the author seems to incline toward the opinion of Koch and Schiefferdecker, that the substance in question is lime-like in character.

C. F. Hodge ^{248 71}_{v. 7, No. 2; Nov. 15} published valuable studies of the living nerve-cell during stimulation. Up to the present series of experiments his work has been confined to observing the changes due to electrical stimulation or to daily fatigue in the cell after it has undergone the usual methods of preparation for the microscope. From the beginning it has been his desire to study the nerve-cell continuously during the process of fatigue. The method employed is the following: Of a pair of spinal or sympathetic ganglia quickly excised from a freshly-pithed frog, the right is placed in a drop of salt solution, upon one of the "stimulating stages"; the left, upon the other. The "stimulating stages" are made by looping up the two fine platinum wires, which serve as tips to electrodes of an ordinary du Bois-Reymond coil, through needle-holes in a thin piece of glass, so that about two millimetres of each wire are exposed upon the upper surface of the glass, and the wires lie about two millimetres apart. This glass plate is mounted over a hole in a hard-rubber disc of such size as to be conveniently clipped to the stage of a microscope. The ganglia are arranged so that the nerve of each lies on the electrodes, and, the specimens being placed each

under a microscope, a cell, or group of cells in each, which can be plainly seen, is found and brought to the centre of the field. Cells as near alike as possible are, of course, sought out. Now, with the microscopes side by side, with similar nerve-cells of the same animal under each, electrical stimulation is applied to one, while the other remains at rest, and both are observed, measured, and drawn (with the camera) from time to time. A flow of sterilized salt solution is maintained under the cover-slips by means of capillary glass siphons supplied from the same reservoir. Stimulation is interrupted, fifteen seconds' work alternating with forty-five seconds' rest, the primary current being made and broken by a "Lombard clock interrupter." Four Daniels cells, supplying current of 0.5 ampère, were used throughout. At the end of desired time both control and stimulated ganglia were hardened in osmic acid and teased in glycerin for further study.

The chief result of the experiments so far is that the nucleus shrinks, when stimulated under these conditions, more rapidly than when the ganglion remains in the animal's body. This decrease in size is rapid at first, then slower and more rapid again, as observed in a previous set of experiments; but the slowing up at no time amounts to a stand-still or to partial recovery. The controls shrink very little,—3 to 8 per cent., as compared to 60 to 73.7 per cent. in the nuclei of stimulated ganglia. Granules and oil-droplets have been seen to disappear from the cell-protoplasm during stimulation. Stimulation has been continued as long as six days and nights, but active changes cease to be visible after the first five to six hours. With too severe stimulation the cells may show little or no change. The most definite results were obtained with the secondary of a Krüger coil (10,305 μ) at from 10 to 13 centimetres. With the secondary coil at 0, no change in the cells was visible. Motile protozoa, vorticella, and paramœcium were almost instantly killed with this strength of current; whereas they were apparently uninjured when the secondary coil was removed to 10 centimetres.

Circulatory System.—L. Ranvier⁹²⁰_{Jan. 16} has conducted microscopical researches on the contractibility of the blood-vessels, and finds that the pericæsophageal membrane of the frog readily lends itself to the study of the contraction of the vessels, since the only muscular elements contained in it are those which, in the form of

cell-fibres, are annexed to the blood-vessels; it may be subjected to electrical excitation while yet living, but entirely separated from the animal. Under these conditions the arterioles may be seen to contract until the opening of the vessels disappears; the folds of the internal elastic layer become more pronounced and touch each other when the calibre of the arteriole is effaced. The cell-fibres of the vascular wall in repose are entirely composed of longitudinal fibrils, which, in optical section, show like so many refractive circles; these circles become indistinct during the contraction, from the fact that the fibrils while shortening augment in thickness, and lie more closely against each other. Nothing that could be compared to a peristaltic movement can be produced in the arteries by the aid of direct electrical excitation; neither has the slightest contraction movement ever been observed in the capillaries.

A. Spuler, ²⁹_{V. 40, No. 4} from careful investigations, has arrived at the conclusion that the theory of the intra-cellular origin of the red blood-corpuscles affirmed by various authors, or that they develop from hæmatoblasts or protoplasma within the vaso-formative cells (Ranvier), is incorrect, and that these are artificial products developed by traction upon the preparation; so that it is impossible to distinguish whether the young erythrocytes lie in the blood-stream or within cells. He has only found them in the blood-stream, occasionally between cells, but never within them. He is of the opinion that the red blood-corpuscles in mammals are solely nuclear in origin, having observed in the erythrocytes of newborn animals certain central regions, particularly indicated by a special facility for staining, and which he regards as traces of the original nucleus.

Werigo, ²⁶⁰_{Feb.} while examining under the microscope the blood of a rabbit which he had received some minutes before an injection of bacillus prodigiosus in the auricular vein, was surprised to find the blood almost destitute of leucocytes. He repeated the experiment with the same result, and became convinced that the phenomenon was constant. In order to prove this, he made a series of experiments in which he injected cultures of different microbes into the blood, counting the leucocytes before and afterward. The main fact brought forward receives the following explanation: The leucocytes disappear from the blood under the above-named circumstances because, when they have engulfed

the microbes injected (which they speedily do), they are arrested in the organs, especially in the liver, where they pass on the ingested material to the endothelial cells of the organ. The rapidity with which the microbes become inclosed in the leucocytes is most astonishing; it is far greater than we have been accustomed to suppose. It is not the leucocytes alone, however, which undertake the clearance of the microbes from the blood, for the cells of the spleen-pulp, and also the endothelial cells of the liver, take no direct phagocytic functions. The author's researches also lead him to consider that the first event after the injection of any microbes, of whatever virulence, is their inclusion in cells.

E. Tettenhamer ³¹⁶_{v. 8, Nos. 6, 7; July 15} ¹²⁶_{Nov. 25} has studied the origin of the acidophilous bodies of the leucocytes from degenerated nuclear substance, and states that the study of the degenerescence of the spermatocytes in the salamander has enabled him to determine that during the course of this process an acidophilous substance (colorable by eosin, nigrosin, etc.) is formed from chromatin. This substance penetrates by phagocytosis into the cellular body of the leucocytes and there forms the well-known granulations termed acidophilous. Various reasons lead to the supposition that this mode of origin of the said bodies occurs through the degeneration of the cellular nuclei of the organism.

Muscular System.—In the study of the separation of muscle-cells in the heart, Browicz, of Cracow, ⁶_{Nov. 25} from his own investigations, and supported by the recent microscopic researches of Prewoski, of Warsaw, and the views of Tedeschi, has come to the following conclusions: 1. The distinctness of the uniting medium or cementing material which is to be seen in some cases in fresh heart-muscles, especially in those in which it appears as broad stripes, as though swollen, or in those in which it exhibits a rod-like structure (first noted by Browicz), is not a post-mortem appearance. He regards such a condition as the initial phase of fragmentation, as a pathological change, and as the loosening of the connection between the cells forming the muscular cellular tissue. This condition by itself may, in his opinion, exercise an influence upon the functional activity of the heart. 2. It is a change which may lead to a complete separation of the muscle-cells, and even to the complete alteration of the muscular structure of the heart, inducing the utmost confusion in the grouping of

these cells. 3. This fragmentation may extend over wide areas of the heart's substance, and is in such cases the cause of enfeeblement of the function of that organ and of sudden death. 4. Fragmentation may also occur in a disseminated manner (*Heerdweise*), and is then the cause of cardiac insufficiency. 5. It is not by any means a rare phenomenon. 6. It may be observed in an otherwise normal heart-muscle; in cases, that is, in which the blood-vessels, interstitial tissue, and even the muscle-cells exhibit no alteration. 7. It may also, however, be found in association with cloudy swelling and fatty degeneration, or with changes in the interstitial tissue of the cardiac walls and papillary muscles. 8. Disseminated fragmentation may, as Robin believes, be the cause of rupture of the heart. 9. It may also, like arterial vascular changes, be the cause of fibrous degeneration of the cardiac muscle. As regards the age at which this phenomenon is observed, Browicz does not consider it to be necessarily a disease of old age, but asserts that it may be met with in younger subjects. He draws a distinction between the undue visibility of the cement-joints (*Kittleisten*) and the separation of the muscle-cells. The former he regards as the initial pathological condition, and a homogeneous, swollen appearance of this substance as a further stage, which may be followed by complete separation of the cells. It is this latter condition or ultimate stage which, in proportion to its general or localized character, exercises an influence upon the functional activity of the heart. Finally, Browicz is of opinion that the fragmentation of affected cells is brought about by the contraction of healthy fibres, as in the case of waxy degeneration of skeletal and cardiac muscle. He does not discuss the clinical aspects of the question, which appears to have been done by Renaut and Mollard.

Heidenhain ³¹⁶ ¹²⁶ writes concerning the existence of intra-cellular bridges between the smooth muscular fibres and the epithelial cells derived from the external layer. He calls to mind the fact that the cutaneous glands of the amphibiæ are covered exteriorly by a layer of smooth muscular cells, directly applied upon the glandular elements, without the interposition of any connective tissue. This same disposition occurs in the sudorific glands. The author has found that these muscular cells, at the point where they meet the intercalary segment of the excretory

canal, are united to the epithelial cells of this segment by intracellular bridges similar to those existing between the cells of the epidermis. This fact is a convincing proof that the smooth muscular elements belong genetically, as has been affirmed, to the ectoderm.

Rouget,¹⁴_{Nov. 29} in speaking of the intimate structure of the terminal plaques of the motor nerves of the striated muscles, said that, in 1862, he affirmed their existence in the superior vertebræ, stating that this plaque, granular in appearance, was the continuation of the axis-cylinder, and consisted of the same substance as the latter. A contrary opinion, first advanced by Hühne, was that the granular substance was but the support or base of the true nerve-plaque, formed of pale fibres more or less ramified. This theory soon became prevalent in Germany, and even in France. In 1866 Rouget claimed that the pale, non-medullated fibres penetrating into the plaque were not distinct from the fundamental granular substance, and that they continued with it, like the nerves of a leaf with the stem; that the terminal divisions of axis-cylinder of the nerve motor-tube, anastomosing and fusing, constitute the terminal expansion of finely-granular substance. He now concludes, without hesitation, that the terminal plaques form a compact and well-defined whole, not presenting, between the elements of which it is composed, any of the spaces or cavities shown in the representations of the preparations of chloride of gold (arborizations of Ranvier). These ramifications of the axis-cylinder are, up to their ultimate end, juxtaposed, and pressed one against the other.

L. von Thanhoffer¹¹³⁰_{V. 1, Nov. 3, 4, '92} discusses the structure of the transverse striated muscular fibres. This author had already demonstrated, in 1881, that the outer covering of the muscular fibres, the so-called sarcolemma, consists of two lamellæ. This was also confirmed in other directions, and they were given the names "epilemma" and "endolemma." Further researches then showed that the endolemma continues upon the upper surface of the muscular fibrils, and forms a true connective substance, in such a manner that the so-called intervening layer of the transverse striated muscular fibres is not only in connection with it, but is entirely formed by it. The author has lately confirmed this by examinations of the structure of dried muscular fibres; he also found,

in these preparations, that the nerve-ending spread out between the two lamellæ of the sarcolemma. In the muscles of rats he was further able to demonstrate the protoplasmic nature of this muscular connective tissue, and concludes that muscular irritation is conveyed to the separate muscular portions through this substance, and that muscular contraction supervenes through its aid.

R. Vivante ⁸⁰³_{v.9, No.10, '92} has, by Golgi's silver method, and by coloration with chinolin blue, after fixation in Flemming's fluid, made preparations of the bone-cells, which he finds to be irregularly cylindrical, with large vesicular-shaped, centrally-located nuclei. In many instances, fine prolongations extend from these cells, sometimes directly, sometimes through short protoplasmic fibrils. These prolongations extend into the bone-canals, often diverge, and anastomose with the prolongations of the neighboring cells.

Heidenhain ²¹⁷⁴_{No.9, '92} has studied the giant-cells of the bony marrow and their central substances. In a preliminary report the author refers to only one form of giant-cells of the bone-marrow of the rabbit, in which the nucleus is composed of folded and deeply-curved masses, communicating with each other, and closing together in the shape of a hollow ball (the basket-form of authors). Owing to this arrangement of the nuclear mass the cell-body is divided into an "endoplasm" and an "exoplasm," which are connected with each other in the openings or spaces of the nuclear "basket" envelope. The author was able in the exoplasm to differentiate three layers concentric with the nuclear upper surface; the endoplasm also presents differences, but of a complicated nature. These giant-cells always contain a number of central bodies; the smaller cells, in the process of development, are few in number, while the larger, fully-formed ones are numerous. A division must thus occur during the process of development, perhaps in connection with the intercurrent pluripolar mitosis of the giant-cells, whereby the central bodies come in contact with the spindle-tips, while in repose they lie close together in groups. A principal group is usually located in the endoplasm, one or several side-groups in the innermost zone of the exoplasm. The latter are frequently surrounded by an intensely coloring protoplasmic mass, which the author regards as an attraction sphere.

Skin.—In a study of the sensory nerves of the skin of the

external genital organs Dogiel ^{29 1006}_{v.41, No.4; Sept.} recognized three sorts of end-organs: (1) genital nerve-bodies; (2) nervous end-organs (*end-kolben*); and (3) Meissner's tactile bodies. The difference between these bodies is not an essential one. In all cases the axis-cylinder enters the cavity of the bulb and divides into a certain number of varicose branches and threads which, during their course, form a number of spiral turns and anastomose and interblend in the most varied manner, and finally form a complicated system of loops and mesh-work. The differences between the several varieties consist chiefly in the details of combination and ramification of these fibres in the cavity of the bulb. The genital bodies are the most complicated of these structures. The Meissner bodies are the next in complexity. All these terminal bodies have this in common: that from the nervous apparatus of the body in each type a certain number of fibres are separated, which penetrate the epithelium and end free with knob-like tuberosities. The non-medullated fibres pass to the blood-vessels, about which they form a close net-work. Separate nerve-bulbs are connected by fine fibres with each other, though each end-bulb receives several branches. It would appear that the genital bulbs particularly are combined into a close system.

A. Van Gehuchten ^{795 868}_{v.9, No.2; Aug.20} employed the method of Golgi in a study of the epidermic nerve-endings. The nerve-fibres coming from deep down in the tissues form, in the subcutaneous connective tissue, an inextricable net-work, of which the component fibres are frequently divided and interlaced, without, however, anastomosing. Starting from this plexus are an incalculable number of fine nerve-fibrils, which penetrate vertically into the epidermis, there become divided and somewhat monoliform, and end in the mucous layer of Malpighi, with a small terminal button. In the preparations treated by Golgi's method, and in which reduction by chromate of silver shows a considerable number of fibrils, terminal nerve-cells are never met with, either in the deeper portions of the epidermis or in the subcutaneous connective tissue. These elements having been described from preparations treated by chloride of gold, Van Gehuchten concludes that the latter must have colored, in this case, other portions besides the nerve-elements. The author admits that the nerve-fibrils terminate *between* the epithelial cells, and not *in* these cells.

A. Smirnow⁸⁰³_{v.10,p.241; Jan.15,'94}¹²⁶ has discovered additional terminal nervous organs corresponding to the clubbed terminals of Krause; they are situated immediately below the papillary stratum of the chorion. These clubbed terminals, particularly abundant in the plantar skin of the toes, are of two kinds, differing from one another principally by the mode of termination of the nerve. In those of the first category the axis-cylinder, deprived of its myeline and of its other envelopes, which continue with the capsule of the club, ramifies in branches, which anastomose in such a manner as to form a terminal net-work plunged in a homogeneous or slightly granular mass deprived of nuclei. In the clubs of the second category, which are more voluminous and more rare than the preceding, the axis-cylinder does not become divided, and terminates by a button-like thickening imbedded in a small quantity of homogeneous substance.

Tactile Corpuscles.—Golgi's method demonstrates the nerve-nets extending into the papillæ and into the epidermis. In those papillæ not containing any tactile corpuscles the nerves are divided into vascular and sub-epidermic fibrils, furnishing the intra-epidermic nets, which terminate freely at the level of the *stratum granulosum* or the *stratum lucidum*. The fibrils extending to the tactile corpuscles terminate, as has been demonstrated by the methylene-blue method (Dogiel), by a terminal knob.

H. Post³¹⁶_{v.8,No.17} studied the normal and pathological pigmentation of the epidermis. The results were as follow: 1. Pigment is formed in the cells of the epidermis independently of any pigmentation of the mesodermal portions. 2. The pigment originates in the epidermoid formations, partly in branched cells, which are developed from cells of the upper skin-layer, partially in the basal net-work. From the former the pigment is transmitted into the cornified cells of the upper skin-formation. 3. The pigment of the connective tissue may be partially diverted therefrom into the cells of the epidermis. Kromayer's²⁹_{v.42,No.1} researches lead him to conclude that the pigment of the epidermis originates in the protoplasmic fibres of the epithelium. The chromatophores are epithelials corresponding with the course of the fibres of the epithelium. They are the initial expression of pigmentation. The author does not consider the theory of the absorption of pigment as having any anatomical basis.

Pancreas.—Laguesse⁹²⁷_{No.21} has conducted researches on the embryo of the trout and of the sheep, and confirms the opinions of Langerhans, Saviotti, and Latschenberger that the central acinous cells of the pancreas are epithelial, the same as the ordinary pancreatic cells. At first two layers of cells exist, which penetrate more or less into one another, the external being continuous, formed of large, rounded elements with voluminous single nuclei, filled up at their summit with zymogenous bodies (secretory cells); the internal uncontinuous, often reduced to one or two cells, at first polygonal like the external ones, then elongated, become almost homogeneous, staining but slightly; the long nucleus stains readily; the broad nucleole gives place to a vague reticulum, several angular masses of chromatin showing detached against a finely granular background (central acinous cells).

Laguesse,⁹²⁷_{No.28} in referring to the formation of Langerhans's cells in the pancreas, states that these collections of special cells, disseminated from place to place between the acini and first mentioned by Langerhans (1869), have been considered by Lewaschew (1886) as modified acini, probably undergoing regeneration after the exhaustion produced by a long period of secretion. Having studied these cells in the pancreas of an adult man (an executed prisoner) and of a child which had died several hours after birth without having taken any nourishment, and in which they were very numerous, the author concludes that they are not the result of a regeneration of exhausted acini. The development of the pancreas, studied and followed in the embryo of the sheep, led him to consider them as a process of growth of the gland. Besides, long before the pancreas begins its function as a digestive gland granules of secretion accumulate in the internal zone of the cells; and when these come into intimate contact with the blood a portion of them appear as though dissolved, while in others the granules are resorbed. It might be supposed, with some reservations, that an internal secretion always exists in the cell, very much developed, however, and preceding the external secretion in the foetus. Later, each cellular group would be first full, then acinous, furnishing alternately an internal and an external secretion.

Liver.—Henry J. Berkley, of Baltimore,³¹⁶_{V.8, Nos.23,24} in studies on the histology of the liver, made use of Golgi's rapid method, with the exception that he placed the fresh tissue, during from fifteen to

thirty minutes, in a 50-per-cent. solution of picric acid. The following are his most noteworthy results: The vessels of the portal venous system are richly furnished with nerves. The gall-passages are also subjected to nerve influences; the nerves extend along the smooth muscular fibres in the walls of the gall-passages, and probably also penetrate into the connective tissue of the epithelium. The fibres originating in the walls of the vessels and extending between the liver-cells are not nerve-fibres, but belong to a net-work system. The occurrence of medullated fibres within the confines of the true liver-tissue is doubtful.

P. Korolkow³¹⁶_{v. 6, No. 21} studied the nerve-endings in the liver according to Dogiel's modification of the methylene-blue staining process. Of the nerve-fibres entering the liver, the non-medullated fibres are only for the vessels. The medullated fibres branch out between the lobes of the liver and send separate fascicles into them. The fascicles generally separate in the periphery of the lobes into nerve-fibres which soon lose their medulla, these fibres forming a web-tissue between the liver-cell trabeculæ. From this web fine branches extend in the direction of the cell trabeculæ, forming, after again branching out, a net-work upon the upper surface of the latter. Intra-cellular endings were not found by the author, and the nerves do not seem to enter into relation with the bile-canaliculi.

A. Schuberg,²¹⁷⁴_{Nos. 3, 4} in considering the relation of the various tissue-cells in the animal organization, states that he has in single cases found a protoplasmic relation existing between epithelial and connective-tissue cells, between endothelial and connective-tissue cells, between epithelial cells and smooth muscular fibres, between muscular fibres and connective-tissue cells, between transversely striated muscular fibres and connective-tissue cells, and, finally, between transversely striated muscular fibres and epithelial cells. He is of the opinion that such direct relation between various kinds of tissue-cells is by no means an exception, and that it should, rather, in view of the common protoplasmic nature of all cells, be regarded as the general rule.

Intestines.—Henry J. Berkley, of Baltimore,⁷⁶⁴_{v. 4, No. 28} ¹⁰⁰⁶_{Mar.} applied the Golgi method to the study of the nervous endings in the mucous layer of the ileum. From the ganglionic masses of Meissner's plexus numerous non-medullated nerve-fibres run in groups

to the mucous layer. Many of the bundles encircle the arterioles and branch upon them. The other branches pass more directly to the mucosa, where they branch and with the others form a sub-plexus in the muscularis mucosæ. Some of the branches supply curious globular masses, which are regarded as homologous with the motor end-plates. Four or more fibres enter each bulb, which consists of a capsule filled with deeply staining particles in a highly refracting substance. A second form of end-organ has the terminal knobs of the fibres more separately disposed among the fibres.

The granular zone at the base of the follicles of Lieberkühn is devoid of nervous structures, while the bundles passing through it divide into those destined to the plexuses of the villous and Lieberkühn portions. The latter ramify in the adenoid tissue between the follicles, forming an open plexus. The fibres to the villus are usually distinct in origin and pursue a zigzag course, often twisting about each other, and terminate in end-bulbs. The author does not regard these bulbs as cells, but as homologues of the tactile corpuscles of the skin. The nervous supply of the mucosa is wholly derived from the plexus of Meissner. Free arborescent terminations were not found.

Kidney.—Henry J. Berkley, of Baltimore, ⁷⁶⁴_{v.4, No. 28} concludes, after a study of the intrinsic nerves of the kidney, that the renal nerves enter with the vessels at the hilum, and that, with their multifarious ramifications and ganglionic enlargements, they form a not inconsiderable portion of the kidney's entire substance. From the vascular nerves, which we may call the primary ones, come secondary divisions, distributed throughout all the cortical and medullary-cortical regions in the form of a vast open net-work. That the glomeruli are surrounded by a wide-meshed plexus of fibres having terminal end-knobs approximated closely to the Bowman capsule, but that no finer nerves can be seen penetrating that membrane; and end-terminations within the capsule upon the convoluted vessels, either in the form of knobs or in the finer pointed terminations, cannot be discovered. That fibres pass off singly and separately from the vascular nerves, and are distributed on the convoluted tubes, not only with end-terminations in the form of the well-known globular ending, but also in fine, delicate threads that penetrate the membrana propria of the tube and pre-

sumably enter the cement-substance between the epithelial cells; and that the function of these divisions to the tubuli contorti is probably one concerning the urinary secretion. Lastly, that ganglionic enlargements occur widely, but that, strictly speaking, no nerve-cells provided with nucleus, body, and protoplasmic arms are to be found, and that all renal nerves belong to the sympathetic system.

Beggs ³⁶⁴_{Oct. 15, '92} described the fringed epithelial cells of the human kidney, very difficult to study on account of the rapidity with which their fringe became disintegrated after death. Osmic acid alone succeeded in rendering its demonstration possible, and that immediately after death. The fringe occurs on the inner aspect of the epithelium of the convoluted tubules. It differs from ordinary ciliæ in its delicacy (disintegrating very rapidly), its shortness, and the total absence of motion. It is not the same as the ciliated epithelium Heidenhain showed as occurring in the tubular neck in the frog's kidney. That is described as a low, flattened cell, bearing a long cilium extending down into the lumen along the axis of the tubule, having an undulating, whip-like motion, not the waving motion common to ordinary ciliated epithelium. In glands provided with fringed epithelium in which the secretion is intermittent the fringe is present only during secretion.

A. von Kölliker ²¹⁷⁴_{No. 2} has made a study of the nerves of the spleen and of the kidneys, as well as of the bile canaliculi. Preparation of the splenic nerves by Golgi's rapid method succeeded best in the calf. The greater portion of the nerves showed as vascular; another large group belonged to the trabeculæ,—that is to say, to the muscles of the same. There are, besides, branchings and free endings found in many axis-cylinders of the plexus situated in the splenic pulp, which the author considers partly as nerves of the microscopic pulpa trabeculæ and partly as sensory nerves. The first are in relation with the microscopic muscular fibres, of which the pulpa trabeculæ, according to the latest researches, are believed to consist. The fibres regarded by the author as sensory show as dark-edged (medullated) among innumerable fibres of Remak, and the non-medullated terminal ramifications are naturally undistinguishable from the other terminations. Golgi's staining of the Remak fibres strengthens the author's opinion,

long since held, that these fascicles are bare axis-cylinders. The so-called nuclei of the fibres of Remak belong to the short spindle-cells, and with the sparse interfibrillar substance resemble rather the fenestrated membrane of Henle than the sheath of Schwann. In the kidney of a 24-day-old mouse the arterial nerves in particular were colored. They ended at the glomeruli, with several terminal ramifications in many instances; occasional axis-cylinders extended in bow-shape about the glomeruli, either on one or both sides, and were either lost beyond the latter, continued in fine webs, or formed fine terminal arborizations. From here the capsule of the kidney was also innervated. In the renal pyramid only isolated nerve-threads were seen, the tubuli uriniferi showing no nerves. In the liver only very few nerve-branches were exhibited by Golgi's method; the bile canaliculi, on the contrary, were well marked, and it was demonstrated that a large number of these formed no net-work, but had blind endings.

Ureter.—Bianchi-Mariotti ⁴⁹⁰_{v. 4, No. 3} has made researches on the normal histology of the ureter in man, hedgehogs, female sheep, oxen, and dogs. Since the existence of glands and lymph-follicles in the mucous membrane of the ureter is still a subject of controversy, his observations are worthy of attention. In all the subjects mentioned no glands existed in the lower two-thirds of the canal. Only in one instance did the author find (in a sheep) subepithelial vesicles covered with an epithelial coating, the significance of which appeared enigmatical to him. In the upper portion of the ureter, immediately adjoining the *lesser pelvis*, he found a kind of cellular granulation under the epithelium. These granulations at a given time, when studied in seriated sections, are continuous with the superficial epithelium and show a lumen opening into the cavity of the ureter. The glandular appearance is complete. The author is, however, of the opinion that we have rather to deal with the section of a narrow fold terminating in a *cul-de-sac* below the neighboring folds, and suggests the hypothesis that these folds, of special form, may be vestiges of the invaginations of initial generations of tubules, which, as is well known, disappear at a certain moment. Lymph-follicles, also, do not usually exist in the normal ureter. Only once, among a large number of preparations, was a follicular accumulation met with by the author.

A. H. Pilliet, ¹⁶⁵_{v. 29, No. 3} having studied the texture of the vesical

muscle, states that to the two normal muscular coats of the bladder, the outer longitudinal and the inner circular coating, two others may be added: (1) a planum musculare internum with a longitudinal or plexiform course, an offspring of the inner muscular sheath, but always much thinner than the latter; (2) a muscularis mucosæ, much less constant and frequently incompletely developed, separated from the other muscular layers, and following the papillæ of the vesical mucous membrane. The sphincter internus vesicæ does not exist either in the male child or in women; neither is it in man a pre-formed constrictor or sphincter muscle, but rather an accumulation of annular muscular fibres above the prostate, which are pressed together by the development of this organ.

Genital Organs.—G. Slavunus³¹⁶_{V.9,Nos.1,2} has succeeded in demonstrating, by Golgi's method, the finer nerves, with their terminations, in the corpora cavernosa of the penis, the glans, the ureter, the testicle, the epididymis, and the vas deferens. In the testicle (rabbit, cat, horse) the nerves form a plexus of fine fibrils around the vessels which accompany these in their course through the seminiferous tubules. From this plexus isolated fibres arise which traverse the membrane proper of the canaliculi, and terminate by thickened endings between the epithelial cellules. Not only the spermatoblasts (Retzius) and the epithelial cells stain by the Golgi method, but the spermatozoïds as well (rat, horse). The intermediary piece and the tail are colored an intense black; the head is but slightly tinted. In this respect the head stains like the nucleus of the nerve-cells as regards their protoplasma.

The nerves of the vas deferens (rat, hedgehog) are composed of rather thick fibres, apparently furnished with a sheath of myeline, by which the muscular coat is furrowed, and terminate therein, after a complicated course. These fibres give out numerous branches which divide, intercross, and constitute a true myospermatic plexus; some of the fibres penetrate into the submucous membrane and terminate in free extremities either in the papillæ or in the epithelium. The nerves of the epididymis are the same as those of the vas deferens. Nerve-fibres penetrate into the corpora cavernosa of the penis (cat and rabbit), which follow the vessels, as well as others, arising from the dorsal nerve. They reach the central portions of the corpora cavernosa, lodging themselves in the trabeculæ, and sending out fibrils which terminate below the

endothelium of the vascular spaces. They are especially abundant in the regions where smooth fibres exist, upon the surface of which they terminate freely. The arrangement is essentially the same in the spongy substance of the ureter and in that of the glans. Contrary to Dogiel, who admits the existence of an intra-epithelial net-work, the author, in referring to the nerve terminations in the epithelium of the glans, only describes free endings. Special cells provided with anastomosed prolongations are disseminated below the epithelium of the glans and of the prepuce, and are especially abundant in the regions where the nerves are numerous. They also occur in the trabeculæ of the corpora cavernosa, and in the vascular walls (dorsal vein of the penis). These are probably not true nerve-cells. The author has besides observed elements, darkened by silver, in the epithelium of the glans and of the ureter, which were furnished with twisted and oddly-shaped prolongations. He considers these as Langerhan's cells.

Eye.—Michel²¹⁷⁴_{No.2} states that by Golgi's method he found in man, as well as in cats and rabbits, numerous neuroglia cells in the optic nerves, the chiasm, and the tractus optici. The cellular body is of medium size; the ramifications are uncommonly numerous and of rather fine calibre, occasionally provided with a knob-like swelling at the end; they form a thick web. The neuroglia cells are particularly numerous in the dorsal section of the chiasm.

Agababou,³¹⁶_{V.8, No.17}; ¹⁰⁰⁶_{Sept.} working under the direction of Arnstein, of Kasan, has studied the nerves of the ciliary body of the eye in the rabbit, cat, and man. An albino cat is killed with chloroform and a 3-per-cent. solution of methyl-blue injected into the carotid; after quarter or half an hour the blued eyeball is excised, and, removing the retina and teasing away the tapetum from the tractus uvealis, the ciliary body may be studied with a low power. The circular course of the nerve-stems of the orbiculus gangliosus is easily seen. These stems divide and form a nerve-mat with scattered ganglion cells, chiefly of non-medullated fibres, and form the vasomotor tracts for the vessels of the ciliary body. The medullated bundles form free "end-brushes" of a peculiar form. The terminal fibres are varicose and relatively thick and end with a knob. The fibres lie at various depths. There is also a superficial "nerve-lattice" of anastomosing fibres. This lies upon the serous surface of the ciliary body. It could not be determined

whether this reticulum is in continuity with that described by Meyer on the front of the iris or not. On the bundles of the ciliary muscles fine varicose fibres appear, with the usual arrangement of nerves of involuntary muscles. Thus four kinds of nerves are represented: (1) vasomotor; (2) motor end-organs of the ciliary muscle; (3) a diffuse lattice on the scleral surface of the ciliary body; (4) terminal tufts in the intermuscular connective tissue. No. 3 is obviously sensory; the terminal tufts of No. 4 are supposed by the author to serve to supply muscular sensation and thus to play an important part in accommodation.

Dogiel ²⁹ ¹⁰⁰⁶ _{V.41, No.1, Mar.} has investigated the minute structure of the retina by means of the methyl-blue process (precipitating the blue by picrate of ammonia osmic acid mixture) and sums up his results as follows: 1. The retina contains the following nervous elements: (*a*) cells with protoplasmic processes and an isolated axis-cylinder process which passes directly into the axis-cylinder of a nerve (cells of the first group); (*b*) cells with protoplasm process and an axis-cylinder process, the latter not directly connected with nerve-fibres, but dividing into these branches forming a reticulum; (*c*) cells with only protoplasm processes. 2. The axis-cylinder of nerve-fibres begin: (*a*) directly from the cell-body or a protoplasmic process of such a cell; (*b*) from the nerve-net formed by the axis-cylinder processes of the second group, and finally (*c*) directly from nervous branches and threads derived from the subdivision of the third group. 3. The protoplasmic processes of all nerve-cells of the retina unite to form a reticulum, as a result of which the cells belonging to a group or type are united into a colony. 4. Like the axis-cylinder processes, the protoplasmic processes have an indubitable nervous nature and are not related with either the blood-vessels or glia-cells. 5. The body, as well as the fibres, of the nerve-cells consists of a fibrous and interfibrillary substance, and part of the fibres of a cell pass into its axis-cylinder. 6. The nerve-cells possess higher nervous functions, as well as nutritive processes. 7. The nerves are not to be regarded as completely isolated individuals (in the sense of Waldeyer's neurons). The figures accompanying the paper are excellent and seem to establish his positions. It may be remembered that Herrick ²¹⁷⁵ ₁₉₂ has described the connection of the nerve-cells in the retina by a reticulum.

Ranvier, ⁹²⁰ _{Dec.26, '92} who has made a study of the vessels and the

clasmatocytes of the hyaloid membrane in the frog, states that the latter membrane, separating the retina from the vitreous body, is highly vascular in batrachians; all of the vessels, whatever be their diameter, are surrounded by a very thin accessory membrane, lined with cells, each one formed of a nucleus and a ramified protoplasmic mass, with arborizations. These prolongations anastomose in such a manner as to form a continuous net-work, which is attached, as are also the cellular bodies from which it depends, to the membrane by which it is covered. In the meshes circumscribed by the blood-vessels clasmatocytes are found absolutely similar to those produced *in vitro* at the expense of the leucocytes. The prolongations of the clasmatocytes do not anastomose. There are no nerves in the hyaloid membrane, which proves that the direct action of the nerves on the smaller vessels is not indispensable to the function of an organ, whatever be the delicacy and the activity of this function.

Bajardi, ⁴⁰⁹_{v.19, No.2} in a contribution to the comparative histology of the iris, states that he has found, with the aid of the Martinotti method (chromic acid and saffron) and that of Unna (orcein), a layer of radiated elastic fibres in the iris of birds (chicken, pigeon) and of mammals (rabbit, rat, man), situated between the layer of vessels and the posterior border; he is of the opinion, owing to their number, disposition, etc., that they take part in the dilatation of the pupil.

Ear.—Kirilzen ⁶⁸⁵_{Sept.} has studied the origin and central course of the acoustic nerve in the guinea-pig, and has reached the following conclusions: 1. The fibres of the acoustic nerve, at least of its posterior root, do not terminate either in the internal acoustic nucleus or in the nucleus of Deiter. 2. The anterior nucleus and the acoustic tubercle are the primary centres for the posterior root. 3. The upper olivary body is a centre of the same order for the acoustic nerve. 4. The fibres of the acoustic nerve, terminating in the upper olivary body, originate in the nerve-trunk and project themselves into the trapezoid body; they are radicular fibres,—that is, fibres of which the course is not interrupted by ganglion cells. The author is not able to determine whether these fibres belong to the anterior or to the posterior root of the acoustic nerve. 5. The acoustic striæ originate in the acoustic tubercle, surround the restiform body, then extend forward, and pass obliquely through the

raphé in order to reach the olivary body of the opposite side and probably to partially terminate there; the greater number of the fibres forming the acoustic striæ join themselves to the lower lemniscus, and then extend to the posterior segment of the posterior corpora quadrigemina, from whence it is impossible to follow them. Another portion, of but little importance, extends to the upper hemilateral olivary body and to the posterior homolateral corpora quadrigemina.

Lenhossék¹¹⁰⁹_{v.3,p.231} states that his researches on the nerve terminations in the maculæ and cristæ acousticæ, made upon rabbits by Golgi's method, enable him to confirm the conclusion already formulated by Retzius, Van Gehuchten, and Cajal: That the terminations of the fibres of the acoustic nerve in the sensorial epithelia of the organ of hearing, in the maculæ and cristæ acousticæ as well as in the basilar acoustic papilla, are always in the form of free ramifications. The relation existing between the terminal fibrils and the ciliated cells are those of contact. The histogenetic and probably, also, the trophic centre of these fibres is represented by the ganglia of the acoustic nerve. The ganglion cells of the vestibule and the cochlea are all bipolar (oppositopolar), and retain this form in a definitive manner; contrary to the cells of the spinal ganglia, which are only opposito-polar in the first stages of their development. The two prolongations do not present the same character. This fact has already been mentioned in connection with other cerebro-spinal ganglia, with the exception that in the latter the finer prolongation is the central one, while in the acoustic ganglia the opposite is the case, the central prolongation being the thickest. It would not appear, however, that the differences have any important signification. In the maculæ and cristæ acousticæ the ciliated cells are only with great difficulty satisfactorily stained when they show a light-brown color. The basement cells take on an intense black. All these elements coincide with the characters already described by various authors. The nerve-fibres, deprived of their myeline sheaths, cross the basilar membrane, after having been previously divided into divergent branches or not, as the case may be, but without forming, contrary to the opinion advanced by Niemack, a subbasal plexus. The fibrils thus penetrating into the epithelium are of variable calibre; they enter vertically between the basement cells and reach

the level of the deep-seated extremities of the ciliated cells. Here they separate into branches (three to four) which irradiate horizontally,—that is to say, parallel with the surface of the epithelium,—and, after a certain course, curve backward along the lateral face of a ciliated cell, soon to terminate in a free point. This is the general distribution plan of the terminal arborizations of the acoustic fibres. Certain complications may present themselves, one of the most important being that the horizontal ramifications send out fine ascending branches, which connect with the ciliated cells without attaining the surface, and also some descending branches, which become engaged between the basement cells and terminate more or less near the basal membrane.

H. Ayers ²⁴⁸ ¹⁰⁰⁶ continues his studies on the morphology of the vertebrate ear, using the method of Golgi. This method, in the hands of Retzius and Van Gehuchten, led to the conclusion that the nerve-endings in the organ of Corti are intercellular. This author, however, considers that these results were derived from preparations which had been imperfectly colored. His own preparations show unmistakable instances of direct continuity of nerve-fibres and hair-cells. His conclusions are summed up as follows: (a) the hair-cells and the ganglionic cells in connection with them constitute a single morphological unit,—an acoustic element,—which effects connection between superficial and central points; (b) no fundamental distinction exists between acoustic and olfactory elements; (c) the so-called “spiral fibres” are only short portions of radial fibres, which reach their destination by a circuitous path; (d) all fibres of the eighth nerve, so far as is definitely established, originate in the hair-cells; (e) in the embryos of all mammals the eighth nerve is made up at one stage of nerve-fibres which arise from the sauropsida organ, and, at the disappearance of this and the simultaneous formation of the organ of Corti, the acoustic passes over to the latter, thus altering its connections.

Olfactory Organs.—C. Judson Herrick ¹⁰⁰⁶ ^{Sept.} ably reviews the current ideas of the structure of the olfactory organs and gustatory bulbs.

The application of Golgi's method to the peripheral nervous system, especially to the sense organs, has proven of late a very productive field of investigation. The uncertainty formerly existing in the minds of many investigators as to the exact nature of

the termini of the olfactory nerve in the nasal cavity and in Jacobson's organ seems now to be quite satisfactorily removed. The concurrent testimony of so skillful investigators as Cajal, Van Gehuchten, Lenhossék, Brunn, and Retzius leaves but little doubt that the so-called olfactory cells of the olfactory epithelium and of Jacobson's organ are real nerve-cells, and that there is actual nervous continuity between the cilia at one pole and the fibre of the olfactory nerve springing from the other pole of these cells. In fact, the relations here are very like those commonly described for the organs of the lateral line of the lower vertebrates and more recently for the skin of some of the worms.

When we come to the nerve-termini in the taste-bulbs, the recent authorities are by no means so harmonious. Whether the taste-cells are really connected with the adjacent nerve-fibres may fairly be considered an open question, in spite of the recent striking results of Retzius ²¹⁷⁶_{B.4,6} and of Lenhossék. ³¹⁶_{V.2, No.4} Herrick quotes from the latter paper: "The results of Fusari and Panasci, so often quoted recently, that they (the taste-cells) pass directly into nerve-fibres at the basal pole, are incorrect. On the contrary, they all end obtusely. This is not a case, then, of typical, well-developed nerve-cells, which give rise to peripheral nerve-fibres, as is the case with the olfactory cells and the sensory cells of the epidermis of *Lumbricus*, but of sensory epithelial cells which are related to the nerve-fibres by contact only."

In this author's preparations from the rabbit the nerve-termini are of two kinds: 1. Intergemmal fibres previously described (by Sertoli, in 1876, and others) which pass up between the taste-bulbs and end free at the surface. They probably are not concerned with the sense of taste. 2. Perigemmal fibres (one to three in number) pass to the base of the bulb and rise up, branching freely and enveloping the bulb completely. They do not anastomose, but each branchlet ends free in a little tuberosity. In the fish *Barbus vulgaris* intergemmal fibres cannot be demonstrated and the perigemmal fibres are much more regularly arranged, all ending in a ring at the apex of the bulb. In this fish to a slight extent, and much more conspicuously in *Conger vulgaris*, these fibres give off, just as they separate at the base of the bulb, numerous short, exceedingly varicose fibrils, which form a cup-shaped body ("cupula") enveloping the base of the bulb. In the latter type, too, there

are fibres loosely enveloping the neck of the taste-bulb which are probably homologous with the intergemmal fibres of the rabbit.

As to the morphological significance of the taste-cells, the author continues: "By their characteristic reactions with stains, their form, their cilia, and, above all, their functional significance, they ally themselves directly with nerve-cells, from which they are distinguished only by the lack of a nervous process. They represent, as it were, *short nerve-cells without processes*, nerve-bodies in which the function of the process has been supplanted by projections which pass to them from other distant cells. From the results recently brought out as to nerve-termini in the auditory organ (Retzius), in the skin of vertebrates (Fr. Eilh. Schulze, Van Gehuchten, Retzius), in addition to the present contributions, we are in a position to assert that *that relation which the author and Retzius have shown in the skin of the earth-worm prevails in the vertebrates in no place except in the olfactory mucous membrane.*" This does not agree with the recent results of Ayres on the connections of the hair-cells of the auditory organs. Retzius, in the work cited above, agrees perfectly with the results of Lenhossék, except that in his earlier paper ²¹⁷⁶_{v.4} he found branches of the perigemmal fibres penetrating into the taste-bulbs between the taste-cells. This, however, he does not find in the fish. In his later paper ²¹⁷⁶_{v.5} he says: "I have recently, in Golgi preparations of the mucous membrane of the mouth of *Salmo salar*, been able to examine many hundred end-bulbs, and affirm that I have never certainly seen one nerve-fibre penetrating into the interior of these structures, but only the arrangement described by Lenhossék."

If these results can be relied upon, the organs of taste must morphologically be more widely separated from those of smell than has hitherto been customary. The familiar fact that sapid substances must be present in fluid solution in order to be perceived, and that odorous substances, in air-breathing animals, at least, must be present in gaseous media, may point to physiological differences in the end-organs involving profound structural modifications. But it is more probable that the difference, if difference there be, finds its basis in organogeny rather than in physiology. Thus, the processes of the olfactory cells do not connect with any other cells centrally. Preparations recently made by Herrick's brother, both by Golgi's method and by the hæma-

toxylin process, prove conclusively, if additional proof were necessary, that the fibres of the olfactory nerve as they pass into the olfactory tuber break up into terminal brushes (*end-bäumchen*) in the glomerules without coming into relations with any cells at this end of their course. In accordance, then, with the current morphological ideas of nervous structure, the peripheral neuron of the olfactory system would consist of the olfactory ganglion cell in the nasal membrane, its axis-cylinder process which forms one of the constituent parts of the olfactory nerve, and its terminal brush in the glomerule.

(According to views current in some quarters, the fibre of the olfactory nerve does not run continuously from the nasal epithelium to the glomerule, but consists of several nerve-units in moniliform connection. This, however, if true, would not materially affect the question now in hand.)

The nerves supplying the taste-bulbs, on the other hand, unquestionably spring from nerve-cells in the ganglion at the root of their proper nerve-trunk. Since, then, the ganglion cell is at the central end of the fibre, the terminal brush must be sought at the peripheral end,—viz., in the “perigemmal fibres.” It is obvious that the neuron is complete without the taste-cell; in fact, the latter would be an inexplicable structure if it were found in direct continuity with the nerve-fibre.

The views of Lenhossék and Retzius, though concordant with each other and with the most recent morphological ideas of nervous structure, are so different from those commonly held that it is not surprising that they should not find ready acceptance in all quarters.

Frederick Tuckerman, in a note recently contributed to the *Anatomischer Anzeiger*, commenting on these views, calls our attention to the fact that he had in 1889 discovered the “intra-gemmal” fibres described in Retzius’s earlier account of the taste-bulbs of mammals. He, however, seems unwilling to admit that the question as to the nervous connections of the taste-cells is closed. Further investigation in this interesting field promises much of value, and it may be confidently expected that corroborative evidence will soon be forthcoming.

Taste.—C. Arnstein²⁹_{v. 41, No. 2} has made a study of the nerve-terminations in goblet-cells of mammals, and, basing his opinions

upon the results of methyl-blue and isolation preparations of these cells, decisively states that the terminal fibrils never extend into the central prolongations of the axial gustatory cells, but only lie close to these, climbing up upon them, and having free endings in the region of the round opening at the apex of the taste-bud of the tongue. The cortical cells of the taste-buds are also surrounded by varicose nerve-fibrils, which here have free endings. The author considers the latter as purely sensory, while he regards those extending along the axial cells as terminal fibres of the glossopharyngeus.

Lenhossék ^{316 1006}_{V.8, No.4; Mar.} has reached conclusions very similar to those recently published by Retzius. The nerve-fibres always end free in the bud. In the rabbit two sorts of nerve-termini are encountered,—the perigemmal and intergemmal branches, the former being probably a subepithelial plexus, which contains a large number of small fusiform or multipolar cells. The author hesitates to regard these as nerve-cells, but withholds judgment. Respecting the gustatory cells the author says “they represent short nerve-cells devoid of processes, the function of the processes being assumed by those of other cells.” Except in the olfactory regions, vertebrates afford no illustration of the structure described in the earth-worm, where the epithelium cell sends its processes into the central nervous system.

MICROSCOPICAL TECHNOLOGY.

E. H. Williams, of Iowa City, ⁹_{Jan.7} observed, even among men who paid considerable attention to microscopical manipulation, that very few are able to tell with any certainty the difference between even well-marked benign and malignant growths.

The reason for this he ascribes to the fact that they do not use objectives of proper magnifying power. The majority seem to feel that any magnifying power of less than 500 diameters is too low, while experience shows that a power of about 100 diameters is much better for the ordinary diagnosis of tumors. With a power of 500 diameters the field of vision is extremely limited, and one sees more of the individual cells than of the general arrangement of structures. The low power (say, 100 diameters) is the requisite bird's-eye view, and the grouping and arrangement of cells will give a better clue to diagnosis than

individual cells can, no matter how well stained or how clearly defined by the lens.

It seems almost impossible to eradicate from the minds of the general mass of physicians, he says, the idea that each neoplasm should have its own particular characteristic cell, peculiar only to itself. When the average microscopist will eliminate this idea, and confine his attention more to general views with lower-power objectives, he will find it much easier to make correct diagnoses; at least, of benign and malignant growths.

Staining.—Kaiser ⁷⁵_{June 1} ²_{Sept. 9} recommends the following method of hardening and staining brain or cord: Pieces are laid in Müller's fluid for two or three days, then cut into sections one to two millimetres thick, and left for five or six days longer in the fluid. They next are treated for eight days with Marchi's fluid (Müller's fluid, 2 parts; 1-per-cent. osmic-acid solution, 1 part). Hardening is then completed in alcohol, the tissue having been previously washed in distilled water. Sections cut in celloidin are laid in iron solution (liq. ferri perchlor., 1 part; distilled water, 1 part; rectified spirits, 3 parts) for five minutes, then washed in Weigert's hæmatoxylin solution and warmed in a fresh quantity of that solution for a few minutes. After washing in water differentiation is effected by Pal's method; the sections are then immediately washed in ammonia water to neutralize the oxalic acid. By this process the nerve-fibres are stained dark-brown or black; the pigment and nucleolus of the ganglion cells usually are blackish brown. The use of a contrast stain is not advisable.

Adolph Schmidt ⁴_{Mar. 6} ¹¹²_{June} gives the result of his investigations of the color reaction of sputum with Ehrlich's tri-acid staining fluid, or Biondi's triple-stain mixture. He has found that the sputum in cases of pneumonia is stained red or violet-red, while in other cases it varies from gray to violet, without admixture of red. His process consists in placing a small portion of the sputum in a test-tube, with 2½-per-cent. solution of HC₂ in alcohol, and shaking until it is entirely broken up and separated. It is then allowed to settle, the alcohol poured off, and the tube filled with distilled water. Then three drops of the stain are added. When the particles are stained the fluid is poured off again, and the distilled water used to wash out the excess of color. The whole process requires, at most, ten minutes.

Stroebe ⁸⁵⁴_{B.4, No. 2; July 29}² describes a new method of his own for staining axis-cylinders; it has proved serviceable in the study of nerve-regeneration, and is also quite satisfactory for staining the same structures within the central nervous system. As the fine axis-cylinders of the young nerve-fibres met with in the earliest phases of regeneration form severe test-objects for stains, the present method, in Stroebe's opinion, promises to be of real service. Its special feature is that a practically isolated stain of the axis-cylinder is obtained. Effective contrast staining is possible. The method is as follows: 1. The tissue is hardened in Müller, thereafter, if desired, in alcohol, and sections are cut as usual. 2. Stain in fresh saturated aqu. sol. aniline-blue ten minutes to one hour; the sections become blue-black in color. 3. Wash off excess of stain in water; then place in a porcelain dish of absolute alcohol to which have been added 20 to 30 drops of 1-per-cent. sol. of alkali alcohol (1 gramme caustic potash to 100 cubic centimetres— $3\frac{1}{4}$ ounces—alcohol; allow to stand twenty-four hours; filter). In the alkali alcohol sections turn of a rusty-red color, clouds of reddish coloring matter issuing from them. As soon as these cease to form and the section is of a light red-brown color and transparent, differentiation is complete (one to several minutes). 4. Wash in distilled water (five minutes); the sections acquire a clear blue tint. 5. Place in following contrast stain (a quarter to half an hour): concentrated aqu. sol. safranin diluted with equal parts of water. 6. Place in absolute alcohol to remove excess of safranin and to dehydrate; the section now looks red, with a tinge of blue. Xylol, xylol-balsam. Axis-cylinders appear dark blue; medullary sheaths, cell-protoplasm, ground-substance, and cell-nuclei various shades of red; the last-named sometimes retain the blue color. V. Kahlden ⁸⁵⁴_{June 2; July 29}² has a note upon a method of staining axis-cylinders and other structures of the central nervous system originally described by Van Gieson. It is as follows: 1. Stain sections—preferably from tissues hardened in Müller's fluid—three to five minutes in hæmatoxylin (Delafield's or ordinary alum hæmatoxylin); wash well. 2. Stain again in a mixture of sat. aq. sol. picric acid and sat. aq. sol. acid fuchsin, —sufficient of the latter to make a dark-red fluid. 3. Pass rapidly through water; then through spirit, alcohol, organum-oil; mount in balsam. V. Kahlden has had good results with this

method. Axis-cylinders are stained deep red, medullary sheaths yellow, neuroglia a reddish tint, nuclei blue or violet, sclerosed tissue an intense red. Hyalin material stains a deep red, colloid a fainter red or even slightly brown. The relation of amyloid material, which stains a light red, to the tissue constituents, especially the vessel-walls, is brought out better by this than any other method.

Kultschitzky ³¹⁶_{B.8, No. 10;} ¹⁰⁰⁶_{June} describes a process for staining neuroglia. The author lays great weight upon the previous treatment which, in this case, consists in fixation with a mixture consisting of a solution of potassium bichromate and cupric sulphate in 50-per-cent. alcohol saturated (in the dark) after addition of $\frac{1}{2}$ to 1 per cent. of acetic acid. The fixation takes place in the dark, as does the hardening in strong alcohol, at first. For large fragments two to three months are required for fixation. Sections are cut in paraffin. The formula recommended, in case an aqueous solution is desired, is as follows: 2-per-cent. acetic acid, 100 parts; "patent-saurem rubin," 0.25 part; saturated picric-acid solution in water, 100 parts. The staining requires but a few seconds, after which sections are washed in 96-per-cent. alcohol. The rubin is almost insoluble in alcohol. Washing in water is to be avoided. If overstained, there is differentiation of neuroglia from nerve-cells, the latter staining yellowish red, the former red violet. An alcoholic solution of the rubin (100 parts 96-per-cent. alcohol and 3 to 5 cubic centimetres— $\frac{3}{4}$ to $1\frac{1}{4}$ drachms—of the above solution) is also recommended, but it stains very slowly.

S. H. Gage of Cornell, ¹⁰⁶_{Dec., '92} believing that the deterioration of the hæmatoxylin solution might be due to some living ferment or ferments, and if these could be eliminated the solution would retain its excellence, succeeded in elaborating an aqueous solution that will not readily deteriorate. It is prepared as follows: Distilled water, 300 cubic centimetres ($9\frac{1}{2}$ fluidounces); potash alum, 10 grammes ($2\frac{1}{2}$ drachms); chloral hydrate, 6 grammes ($1\frac{1}{2}$ drachms); hæmatoxylin crystals, $\frac{1}{10}$ gramme ($1\frac{3}{4}$ grains). The water is placed in an agate or porcelain dish and the alum added either in powder or small pieces. The water and alum are boiled for five minutes; when cool the chloral hydrate and the hæmatoxylin are added. It is advantageous to dissolve the hæmatoxylin in 5 to 10 cubic centimetres ($1\frac{1}{4}$ to $2\frac{1}{2}$ drachms) of absolute or 95-per-cent. alcohol

before adding to the alum solution. The color will be quite light at first, but in a week or two it will be of a dark purple. The boiling is to destroy all living objects in the water or alum, and the chloral hydrate is to prevent the development of germs that accidentally reach the solution after its preparation. The solution may be made more concentrated by adding more hæmatoxylin. For slight dilution distilled water will answer, but the mixture of alum, chloral hydrate, and water is the best diluent.

During eight months the above preparation had remained in the laboratory, subjected to all the vicissitudes of heat, dust, etc., that an ordinary histological reagent must endure. The bottle had no deposit upon it, and the solution was entirely devoid of spores or mycelium of fungi, and was, in fact, as good as when first made.

P. G. Unna ^{744 499}_{Apr. 29; July} differentiates bacilli in tissues by a polychromic methylene-blue solution, which contains methylene red and violet in addition to the blue. The sections are transferred from alcohol, and allowed to remain in the stain for at least ten minutes. They are then passed through water into 33-per-cent. tannic-acid solution to decolorize, allowed to remain from two to five minutes, then rinsed with water to enable the exact tint to be observed more readily. If satisfactory, after a thorough washing with water, the sections are placed in absolute alcohol, or a solution of gold in the same if a yellow counter-stain be desired, cleared in oil of bergamot, and mounted in balsam. If the excess of stain is not readily removed, a few minutes' immersion in 25-per-cent. nitric acid, followed by dilute spirit, water, and absolute alcohol, respectively, will effect its removal. By adopting this method it is said to be possible to distinguish two kinds of nuclei (violet and blue), the fibrin, and the protoplasm of the plasma-cells. The bacilli stain red, whilst the mucus surrounding them is blue, and the organisms are said to appear in their natural character,—“in fish-roë-like masses of vegetable mucus.” It is claimed that the process is particularly suitable for use in the study of leprosy. It appears to depend on the property, also utilized by Nicolle, by which tannin converts methylene blue into an insoluble form.

A. Kolossow ^{401 77}_{B. 9, H. 1; Nov., '92} contributes a new method of treating tissue with osmic acid, especially recommended for epithelium, upon

which the writer chiefly experimented. When tannic or pyrogallie acid is added to a solution of osmic acid an immediate decomposition takes place. The color of the latter changes, first, to black, then to blue-black. The importance of this reaction consists in the fact that those portions of the tissue fixed by the osmic acid take on an intense grayish-black stain, which brings out the finest details in the structure of the cells. He uses the following mixture: Distilled water, 450 cubic centimetres ($14\frac{1}{2}$ fluidounces); alcohol (85 per cent.), 100 cubic centimetres ($3\frac{1}{4}$ fluidounces); glycerin, 50 cubic centimetres ($1\frac{1}{2}$ fluidounces); tannin puriss., 30 grammes (1 ounce); pyrogallie acid, 30 grammes (1 ounce). This is made in the following manner: 30 grammes (1 ounce) of tannin are dissolved in 100 cubic centimetres ($3\frac{1}{4}$ fluidounces) of water; the solution is allowed to stand in an open vessel for from twenty-four to forty-eight hours. As a result a precipitate of ellagic acid forms. This is filtered. To the filtrate is added a solution of 30 grammes (1 ounce) of pyrogallie acid in 100 cubic centimetres ($3\frac{1}{4}$ fluidounces) of water. To this is added the rest of the water, the alcohol, and glycerin. The result is a clear yellowish-brown solution, which, added to the osmic-acid solution, instantly changes it to blue-black. No precipitate is formed even after the lapse of months.

To fix the tissue, a 1- or 2-per-cent. watery solution of osmic acid may be used, or this mixture: Alcohol absol., 50 cubic centimetres ($1\frac{1}{2}$ fluidounces); dist. water, 50 cubic centimetres ($1\frac{1}{2}$ fluidounces); ac. nitric. conc., 2 cubic centimetres ($\frac{1}{2}$ drachm); osmic acid, $\frac{1}{2}$ gramme ($7\frac{3}{4}$ grains). This, if kept in a cool place, will remain unchanged indefinitely. The solution does not penetrate the deeper layers of tissue readily. It is, therefore, more especially adapted to the treatment of superficial epithelia, etc. It is used as follows: The bit of fresh tissue is first washed with a normal salt solution (0.6 per cent.), to remove the serous fluid. Then it is immersed from ten to fifteen minutes in either the watery or the alcoholic solution of osmic acid, then for about five minutes in a solution of osmic acid not stronger than $\frac{1}{4}$ per cent. It is then washed in distilled water, and finally hardened in 85-per-cent. alcohol, and then in absolute alcohol. The developer (for so he calls the solution) takes on a dirty gray-green color, but may be used a second time. The first coloring is bluish, which changes

to gray-black upon treatment with alcohol. This tint is permanent.

Seguin¹_{Aug.19} exhibited a specimen stained with a 1-to-2000 solution of nigrosin. One of the advantages of this staining agent is that specimens may be safely left in the solution for twenty-four hours.

Ehrich, of Berlin,²²_{Jan.31} has for a number of years been studying several biological therapeutic questions by the introduction of coloring material into the bodies of animals. In tadpoles he found that *neutral red*, a material that had not hitherto been used in microscopic work, was the best suited for staining purposes. If the color was diluted and an alkali added, a fuchsin color was produced. From the manner of staining it could be seen whether an animal tissue was alkaline, weakly alkaline, or acid. If, for instance, a tadpole was made to swim in a weak solution of neutral red (1 to 2,300,000) it absorbed the coloring material and became red in a quarter of an hour. If it was kept in the fluid longer, all the tissues of the body, brain, etc., became perfectly red. Neutral red must, therefore, be possessed of two properties. 1. It must be able to penetrate the covering membranes of the living tissues. 2. There must be something in the cells that has an active attraction for the staining material. Were these substances in solution or morphitic? A glance through the microscope showed a number of intensive red cells, which, in many respects, corresponded to the cell granules. The method of coloring had sources of error, however, in two directions: (1) there was the possibility that the apparent granules were only deposits of coloring matter in the cells; (2) by lengthened experiment the nuclei degenerated and became larger. From these considerations sprang the following practical conclusions: (1) the staining should be produced as quickly as possible; (2) it should be done with the smallest possible material; and (3) as a "control" small pieces of the tissue should be stained in the solution after its death.

If all three factors agree, it might be assumed with certainty that profound nuclei had undergone a vital staining. In the lungs there were certain cells filled with red, coarse granules; these were the true phagocytes of the lungs. The extent of staining of nuclei was very great. He had stained both in the higher and lower animals, and in plants. By careful manipulation the color

in the living cells could be varied. Every cell had had its specific nucleus as regarded staining. In a solution used by him there was a little methylene blue from a previous experiment. After the staining, the smooth muscular fibres showed the nuclei colored blue, whilst all the other tissues were red. He was convinced that by the aid of such experiments conclusions on important functions of the living cell-granules could be reached.

Moreno⁶_{Dec.10,'92} proposes a new method for determining whether a child has breathed. He points out that the epithelium of the alveoli of the lungs before birth is of a cubical character, but that after respiration has taken place it is flattened out into the ordinary tessellated variety. In order to determine whether this change has or has not occurred, he injects a solution of nitrate of silver of the strength of 1 in 300 into the bronchus, which is then tied, and the whole lung suspended in the same silver solution for some hours. It is then dried, washed with distilled water, and hardened in spirit, during which, being exposed to the action of light, the interepithelial cement reduces the silver salt and becomes blackened, so that the outline of the cells can be made out. Sections are then made and a solution of chloride of sodium employed to wash away any excess of silver. The sections are mounted in glycerin and examined.

Mounting.—E. M. Nelson²⁶⁰_{Feb.} recommends the following formula to find the refractive index of various mounting media: Provide two precisely similar equi-convex lenses whose identical refractive index, m , and radii, r , are known, and cement them together with the mounting medium, whose refractive index has to be determined. Now measure F , the principal focus of the combination, then the refractive index of the mounting medium

$$m' = 2m - 1 - (r \div 2F).$$

It is convenient to make the radii of the lenses 2 inches. Then

$$m' = 2m - 1 - (1 \div F).$$

For example, let the refractive index $m = 1\frac{1}{2}$; suppose the combination to have no focus (like a piece of plane glass), then $F = \infty$, and $1 \div F = 0$. Therefore

$$m' = 2m - 1 = 2.$$

Let $F = +2$, and we shall have the following result, which is the same as that of the equi-convex lenses:—

$$m' = 2m - 1\frac{1}{2} = 1\frac{1}{2}.$$

If the principal focus of the combination F is negative, the sign before the fraction changes. Let $F = -2$; then

$$m' = 2m - 1 - (1 \div -2) = 2\frac{1}{2}.$$

This method gives a great range of readings for indices varying between 2 and $2\frac{1}{2}$.

E. Goodall, of Wakefield, ¹⁶⁶_{Apr.} recommends glycerin-jelly as a mounting medium for museum preparations for healthy or diseased sections and pieces of nerve-tissue in the fresh state, and for portions of diseased cerebral meninges and blood-vessels. The following is the formula for the jelly: Best French gelatin, $\frac{8}{10}$ gramme ($12\frac{1}{2}$ grains); glycerin, 25 cubic centimetres ($6\frac{1}{2}$ drachms); sat. sol. boracic acid, 75 cubic centimetres ($2\frac{1}{4}$ ounces). Dissolve the gelatin—cut up—in the boracic solution by heat, add the white of an egg, and apply heat until the albumen has separated out thoroughly; add the glycerin. If the fluids are contained in a flask floating in water, to which the heat is applied, but little loss by evaporation occurs. Filter through a hot-water filter. The jelly should be quite clear. It will have a slight yellow tinge. If this is thought undesirable, less gelatin must be employed; the proportion stated above is that employed for gelatin culture-media, which remain solid throughout the year, and show no shrinkage for a very considerable period. The preparations are put up in glass vessels; Soyka's, Petri's, or Esmarch's dishes are convenient. Pour a little of the melted jelly into the vessel, let it rest, arrange the preparation on its surface, and cover with more jelly. If a fresh section of brain is to be mounted direct from the freezing microtome, it may be floated on to saturated boracic-acid solution; the glass vessel, half-filled with set gelatin, is passed into the fluid beneath the section, and the latter arranged with a camel-hair brush on the jelly. The vessel with its section is then withdrawn, excess of fluid allowed to run off, and melted jelly (not too hot) is poured in up to the brim, care being taken to prevent floating of the section.

It appears to him best not to seal down the lid of a vessel containing glycerin-jelly preparations; fresh jelly can then be added from time to time as necessary. None has yet been added in the case of one-year-old preparations, as no appreciable shrinkage has occurred. A very good background to these preparations of fresh brain is obtained by painting the back and sides of the

glass vessel employed with black bicycle varnish. Glycerin jelly is also recommended by J. E. Huber,⁴⁹⁹
Apr.

The following preparation is recommended:⁵⁵⁶
v. 21, p. 196 Gum dammar is dissolved in benzole to the consistency of a thin syrup. This is strained through an old silk handkerchief, and about one-third of its volume of liquor potassæ is added to the cohate. This is shaken until mixed, well corked, and set aside in a warm place for several weeks. On examination the mixture will be found to have separated into two layers, the lower of which (a resin soap) will contain all the impurities, the upper consisting of pure neutral dammar in benzole. This is drawn off, and to each ounce about 8 to 10 drops of poppy-oil added; the purpose of the latter being to prevent the brittleness which the dry dammar naturally possesses. The mounting medium thus prepared is far too thin for immediate use, but this is easily remedied by leaving the bottle open, or loosely corked, in a warm place for a day or two. If left open, cover the top of the vessel with a bit of lint-cotton or a linen rag to keep out dust.

Fixation.—Gustav Man³¹⁶
v. 8, Nos. 12-23; Sept. uses a fluid composed of absolute alcohol, 100 cubic centimetres ($3\frac{1}{4}$ fluidounces); picric acid, 4 grammes (1 drachm); corrosive sublimate, 15 grammes ($3\frac{3}{4}$ drachms). Pieces should not exceed 1 centimetre in thickness, and be left in twelve to twenty-four hours; then washed in running water, after which they are placed in a 30-per-cent. solution of alcohol (with sufficient tincture of iodine to produce a brown color) for twelve hours; the tissue is hardened in alcohol and imbedded in paraffin. A shorter method is to wash in absolute alcohol for ten hours, changing the fluid at least once, and then, after sectioning, treating the sections with iodine and iodide-of-potash solution. It is stated that the plasma and nuclei are well fixed with slight shrinkage, the cell-outlines being well brought out. Sabrazès, of Bordeaux,¹⁸⁸
Mar. 12 highly extols a solution of gum acacia, kept aseptic by means of a layer of metallic mercury at the bottom of the bottle, for fixing purposes upon the slide, prior to staining of microbes.

Miscellaneous.—A. M. Edwards, of Newark,⁴⁹⁹
Apr. recommends celluloid—viz., wood rendered soluble in ether and alcohol with gum-camphor—as a substitute for glass covers and slides. It is much cheaper than glass and almost as transparent. Being unbreakable and very light, it is especially valuable for sending by

post. It is stronger than wood, has no fibre, and can be cut readily with scissors. It can be obtained with a ground surface as well as plain. The thin celluloid films commonly used for instantaneous coverers can be employed for covers, whilst the thicker kind used in ordinary photography makes capital slides.

Watson Cheyne ²_{July 15} describes a new instrument for delicate dissections, which he has found of great value, especially in separating tuberculous glands which are closely adherent to veins, or in enucleating glands from the midst of important structures,—for example, from the parotid gland. One end is really a fine probe, and is a copy of an instrument which is employed in delicate vivisection experiments with the view of exposing small nerves, vessels, etc. The other end is flattened out and curved, but blunt, and where there is no periadenitis it can be readily slipped inside the capsule of the gland, which is thus rapidly and harmlessly isolated, and can be lifted out.

H. G. Piffard, of New York, ⁴⁹⁹_{Apr.} after devoting much study to the electric illumination, devised a lamp possessing certain peculiarities of construction. The glass bulb, instead of possessing the pear-shaped form usually met with, is cylindrical, and about three inches in length by an inch in diameter, instead of the ordinary horseshoe form and the usual length (four to five inches). The carbon is but three-fourths of an inch in length, while the rest of the apparent filament is composed of copper wire, arranged so as to hold and support the carbon in a vertical position. The carbon is much broader and thicker than in the ordinary domestic electric lamp. When this carbon is rendered incandescent by the passage of a suitable electric current, a vertical streak of light of intense brilliance, about three-fourths of an inch long, and apparently an eighth of an inch wide, is obtained. The minified image of this is focused by mirror or condenser on the object to be examined.

George Whitfield Brown, of New York, ²⁶⁰_{Apr.} describes a new sliding-carriage and stage for the microscope, obviating many of the usual defects, and furnishing a perfect level and precise movements under a power of 2250 diameters.

GENERAL INDEX.

By D. BRADEN KYLE, M.D.,

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PARIS.

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Withdraw <i>alcohol</i> ; regulate food; treat gastric disorder; adn. aperients. <i>Strychnia hypoderm.</i> <i>Quinine</i> , ii. E- 10. If heart-failure, one <i>digitaline</i> grainule (gr. 1-140-0.00027 grm.). Easily assimilated diet, <i>quinine</i> , <i>oxide</i> of zinc, <i>strychnia</i> , and <i>arsenic</i> . <i>Hed-</i> <i>ionidia</i> , <i>nitrate of strychnine</i> , gr. 1-30 to 1-6 (0.002 to 0.01 grm.) twice daily, ii. E-10; subcutaneously, v. A-89; hypnotism, ii. E-10.	ABDOMEN, SURGERY OF.—John H. Pack- ard, Robert G. Le Conte, R. P. Harris, Henry Morris, iii. C-1. INJURIES: Sieur, iii. C-46; F. H. Markoe, Gilbert Barling, Owen, Boiffin, iii. C-47; Hulke, N. C. Mitra, Moran, Herschle, Conner, iii. C-48; Newton, Marsh, Chaput, iii. C-49. OPERATIONS: Mitchell Banks, Senn, iii. C-49; Manton, Richardson, Howitz, Cathcart, J. Rutherford Mori- son, iii. C-50; Haskin, W. Briggs, Mc- Graw, iii. C-51; Butz, Trzebicki, Dela- genière, Baker, Mansell-Moullin, Cushing, Bell, Mygind, iii. 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 Removal of foci as soon as recognized.
 Parenchymatous injections of *hydro-
 gen peroxide*, 111 x xv to xxx (1.6 to 2
 grms.) twice daily. *Carbolic oil* lo-
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 For irritation resulting from removal
 of foreign bodies, *boric-acid* irriga-
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 EMPYEMA, ACUTE. If of nasal origin,
 keep nasal cavity clean, and facilitate
 escape of pus by placing patient with
 head lower than body; avoid surgical
 measures until simple treatment has
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 from too long retaining tampon in-
 serted to arrest epistaxis, removal of
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 drain abscess, leaving oper. for later
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Analgene, v. A-6. *Paraldehyde*, 5ss
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 i. A-25. Smoke-powders dangerous,
 i. A-26. *Strychnia* hypoderm., at night
 1 to 1.0 (0.002 to 0.006 grm.) or gr. 1
 and gr. 1-400 to 1-600 (0.00016 to
 0.00012 grm.); *atropia*, i. A-26. Spray
 inhal. of *peroxide of hydrogen*, with
 a few drops of *iodide of ethyl* on hand-
 kerchief for paroxysm. Reduction of

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by goblet of water, 3 or 4 times in 24	
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silver and corros. sublimate; if urine	
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Bladder washed out with $\frac{1}{2}$ % sol.	
lactic acid, foll. by 3v to x (20 to 40	
grms.) 10 % iodoform emulsion, al-	
lowed to remain 15 min., then drawn	
off, i.	F-46, 47. Intra-vesical injections
of iodoform, 1 part; sulphuric ether	
and olive-oil, each 7 parts; 15 to 90	
minims (1 to 6 c.c.) every 2 or 3 days.	
If pain excessive, in divided doses, i.	
F-47. Instill. of corros. sublimate	
after coacutization. One capsule of	
Squibb's pulv. purified chloride of	
ammonium, foll. by goblet of water,	
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Brachygnathia.....ii. J- 3	COMPOUND COMMUNED. Trephining or chiseling. Removal of fragments, iii. A-41 to 50.	BRAIN, DISEASES—Landon Carter Gray, W. B. Pritchard, R. C. Shultz, J. A-1. ASCITES: Piquet and Ferrier, Jan- sen, iii. A-42; Frank Allport, E. L. Strode, ii. A-43; Gray, Sainsbury, Roughton, Bradshaw, Cotterill, Kenef- ick, McPatrick, Schamberg, Gaudoin, Treves, Stewart, Terrillon, Ransom, ii. A-44; <i>Archiv für Ohrenheilkunde</i> , <i>Zeitschrift für Ohrenheilkunde</i> , ii. A- 45. DISSEMINATED CEREBRO-SPINAL SCLEROSIS: Hervonot, Déjerine, Mensi, Pitres, Buzzard, Charcot, Grasset, Sou- ques, Oppenheim, Robert, Sandby, Roget, ii. A-63; Pierret, Moncorvo, ii. A-64. LESIONS: Schutz, ii. A-35; Bom- berger, Mayfield, Dana, Collins, Bar- ling, Houghberg, Coats, Mills, Pursor, Goodsell, ii. A-36; Bucklers, Leon d'A- stros, Manasse, ii. A-37; Deucher, Dean, Van Stockum, Banerjee, Phelps, Nor- bury, Sommers, Ryan, Hutchinson, Hardy, Monro, Berry, Marsh, Smart, McLaren, Wilkes, Steiner, ii. A-38; Goodell, Decker, Lewis, Dreschfeld, Hardman, Knaggs and Brown, Crocq, Baginsky, Strümpell, ii. A-39; Bück- lers, Patru, Charcot, Sciamanna, Starr, ii. A-40; Rockwell, Thirioleix and Pas- quier, Paret, Wynne, ii. A-42. LOCALI- ZATION: Goltz, Edinger, ii. A-1; Berkeley, Goltz, Cajal, Kölliker, Anstalt, Mure- toff, ii. A-2; Hiss, Herriek, Andriezen, Stacy Wilson, Ransom, Dana, Mott, Sa- vill, Albertoni, Brigatti, ii. A-3; <i>Lancet</i> , Munk, Ferris, Horsley, Shafter, Moeli and Marinisco, Cavazzani, ii. A-4; Gold- schneider, Cavazzani, ii. A-5; Wedr Mitchell, Horton Prince, Leclercq, Monakov, ii. A-6; Seppilli, Heussen, ii. A-8; Munk, Reinhardt, Ferrier, Nothnagel, Seguin, Monakov, Seppilli, Flechsig, Bechterew, Zacher, ii. A-9. MISCELLANEOUS: Merkel, Rake, Möbius and Wagner, ii. A-65; Clevenger, Clado, Finton, Bremer, Horton Prince, Leclercq, Monakov, ii. A-6; Fournier, Benedikt, Sherrington, Reynolds, Phelps, Ferguson, Buzzard, ii. A-66; ANNUAL 1893, Tschirjew,
Bradycardia.....i. B- 32	COMPOUND COMMUNED. Trephining or chiseling. Removal of fragments, iii. A-41 to 50.	BRAIN, DISEASES—Landon Carter Gray, W. B. Pritchard, R. C. Shultz, J. A-1. ASCITES: Piquet and Ferrier, Jan- sen, iii. A-42; Frank Allport, E. L. Strode, ii. A-43; Gray, Sainsbury, Roughton, Bradshaw, Cotterill, Kenef- ick, McPatrick, Schamberg, Gaudoin, Treves, Stewart, Terrillon, Ransom, ii. A-44; <i>Archiv für Ohrenheilkunde</i> , <i>Zeitschrift für Ohrenheilkunde</i> , ii. A- 45. DISSEMINATED CEREBRO-SPINAL SCLEROSIS: Hervonot, Déjerine, Mensi, Pitres, Buzzard, Charcot, Grasset, Sou- ques, Oppenheim, Robert, Sandby, Roget, ii. A-63; Pierret, Moncorvo, ii. A-64. LESIONS: Schutz, ii. A-35; Bom- berger, Mayfield, Dana, Collins, Bar- ling, Houghberg, Coats, Mills, Pursor, Goodsell, ii. A-36; Bucklers, Leon d'A- stros, Manasse, ii. A-37; Deucher, Dean, Van Stockum, Banerjee, Phelps, Nor- bury, Sommers, Ryan, Hutchinson, Hardy, Monro, Berry, Marsh, Smart, McLaren, Wilkes, Steiner, ii. A-38; Goodell, Decker, Lewis, Dreschfeld, Hardman, Knaggs and Brown, Crocq, Baginsky, Strümpell, ii. A-39; Bück- lers, Patru, Charcot, Sciamanna, Starr, ii. A-40; Rockwell, Thirioleix and Pas- quier, Paret, Wynne, ii. A-42. LOCALI- ZATION: Goltz, Edinger, ii. A-1; Berkeley, Goltz, Cajal, Kölliker, Anstalt, Mure- toff, ii. A-2; Hiss, Herriek, Andriezen, Stacy Wilson, Ransom, Dana, Mott, Sa- vill, Albertoni, Brigatti, ii. A-3; <i>Lancet</i> , Munk, Ferris, Horsley, Shafter, Moeli and Marinisco, Cavazzani, ii. A-4; Gold- schneider, Cavazzani, ii. A-5; Wedr Mitchell, Horton Prince, Leclercq, Monakov, ii. A-6; Seppilli, Heussen, ii. A-8; Munk, Reinhardt, Ferrier, Nothnagel, Seguin, Monakov, Seppilli, Flechsig, Bechterew, Zacher, ii. A-9. MISCELLANEOUS: Merkel, Rake, Möbius and Wagner, ii. A-65; Clevenger, Clado, Finton, Bremer, Horton Prince, Leclercq, Monakov, ii. A-6; Fournier, Benedikt, Sherrington, Reynolds, Phelps, Ferguson, Buzzard, ii. A-66; ANNUAL 1893, Tschirjew,
Brain, diseases.....ii. A- 1	ENCEPHALITIS. Leeches and mercury, foll. by <i>iodide of potassium</i> , iii. A-39.	BRAIN, DISEASES—Landon Carter Gray, W. B. Pritchard, R. C. Shultz, J. A-1. ASCITES: Piquet and Ferrier, Jan- sen, iii. A-42; Frank Allport, E. L. Strode, ii. A-43; Gray, Sainsbury, Roughton, Bradshaw, Cotterill, Kenef- ick, McPatrick, Schamberg, Gaudoin, Treves, Stewart, Terrillon, Ransom, ii. A-44; <i>Archiv für Ohrenheilkunde</i> , <i>Zeitschrift für Ohrenheilkunde</i> , ii. A- 45. DISSEMINATED CEREBRO-SPINAL SCLEROSIS: Hervonot, Déjerine, Mensi, Pitres, Buzzard, Charcot, Grasset, Sou- ques, Oppenheim, Robert, Sandby, Roget, ii. A-63; Pierret, Moncorvo, ii. A-64. LESIONS: Schutz, ii. A-35; Bom- berger, Mayfield, Dana, Collins, Bar- ling, Houghberg, Coats, Mills, Pursor, Goodsell, ii. A-36; Bucklers, Leon d'A- stros, Manasse, ii. A-37; Deucher, Dean, Van Stockum, Banerjee, Phelps, Nor- bury, Sommers, Ryan, Hutchinson, Hardy, Monro, Berry, Marsh, Smart, McLaren, Wilkes, Steiner, ii. A-38; Goodell, Decker, Lewis, Dreschfeld, Hardman, Knaggs and Brown, Crocq, Baginsky, Strümpell, ii. A-39; Bück- lers, Patru, Charcot, Sciamanna, Starr, ii. A-40; Rockwell, Thirioleix and Pas- quier, Paret, Wynne, ii. A-42. LOCALI- ZATION: Goltz, Edinger, ii. A-1; Berkeley, Goltz, Cajal, Kölliker, Anstalt, Mure- toff, ii. A-2; Hiss, Herriek, Andriezen, Stacy Wilson, Ransom, Dana, Mott, Sa- vill, Albertoni, Brigatti, ii. A-3; <i>Lancet</i> , Munk, Ferris, Horsley, Shafter, Moeli and Marinisco, Cavazzani, ii. A-4; Gold- schneider, Cavazzani, ii. A-5; Wedr Mitchell, Horton Prince, Leclercq, Monakov, ii. A-6; Seppilli, Heussen, ii. A-8; Munk, Reinhardt, Ferrier, Nothnagel, Seguin, Monakov, Seppilli, Flechsig, Bechterew, Zacher, ii. A-9. MISCELLANEOUS: Merkel, Rake, Möbius and Wagner, ii. A-65; Clevenger, Clado, Finton, Bremer, Horton Prince, Leclercq, Monakov, ii. A-6; Fournier, Benedikt, Sherrington, Reynolds, Phelps, Ferguson, Buzzard, ii. A-66; ANNUAL 1893, Tschirjew,
abscess.....ii. A- 42	ENCEPHALITIS. Leeches and mercury, foll. by <i>iodide of potassium</i> , iii. A-39.	BRAIN, DISEASES—Landon Carter Gray, W. B. Pritchard, R. C. Shultz, J. A-1. ASCITES: Piquet and Ferrier, Jan- sen, iii. A-42; Frank Allport, E. L. Strode, ii. A-43; Gray, Sainsbury, Roughton, Bradshaw, Cotterill, Kenef- ick, McPatrick, Schamberg, Gaudoin, Treves, Stewart, Terrillon, Ransom, ii. A-44; <i>Archiv für Ohrenheilkunde</i> , <i>Zeitschrift für Ohrenheilkunde</i> , ii. A- 45. DISSEMINATED CEREBRO-SPINAL SCLEROSIS: Hervonot, Déjerine, Mensi, Pitres, Buzzard, Charcot, Grasset, Sou- ques, Oppenheim, Robert, Sandby, Roget, ii. A-63; Pierret, Moncorvo, ii. A-64. LESIONS: Schutz, ii. A-35; Bom- berger, Mayfield, Dana, Collins, Bar- ling, Houghberg, Coats, Mills, Pursor, Goodsell, ii. A-36; Bucklers, Leon d'A- stros, Manasse, ii. A-37; Deucher, Dean, Van Stockum, Banerjee, Phelps, Nor- bury, Sommers, Ryan, Hutchinson, Hardy, Monro, Berry, Marsh, Smart, McLaren, Wilkes, Steiner, ii. A-38; Goodell, Decker, Lewis, Dreschfeld, Hardman, Knaggs and Brown, Crocq, Baginsky, Strümpell, ii. A-39; Bück- lers, Patru, Charcot, Sciamanna, Starr, ii. A-40; Rockwell, Thirioleix and Pas- quier, Paret, Wynne, ii. A-42. LOCALI- ZATION: Goltz, Edinger, ii. A-1; Berkeley, Goltz, Cajal, Kölliker, Anstalt, Mure- toff, ii. A-2; Hiss, Herriek, Andriezen, Stacy Wilson, Ransom, Dana, Mott, Sa- vill, Albertoni, Brigatti, ii. A-3; <i>Lancet</i> , Munk, Ferris, Horsley, Shafter, Moeli and Marinisco, Cavazzani, ii. A-4; Gold- schneider, Cavazzani, ii. A-5; Wedr Mitchell, Horton Prince, Leclercq, Monakov, ii. A-6; Seppilli, Heussen, ii. A-8; Munk, Reinhardt, Ferrier, Nothnagel, Seguin, Monakov, Seppilli, Flechsig, Bechterew, Zacher, ii. A-9. MISCELLANEOUS: Merkel, Rake, Möbius and Wagner, ii. A-65; Clevenger, Clado, Finton, Bremer, Horton Prince, Leclercq, Monakov, ii. A-6; Fournier, Benedikt, Sherrington, Reynolds, Phelps, Ferguson, Buzzard, ii. A-66; ANNUAL 1893, Tschirjew,
from aural disease.....iv. C-23, 28	ENCEPHALITIS. Leeches and mercury, foll. by <i>iodide of potassium</i> , iii. A-39.	BRAIN, DISEASES—Landon Carter Gray, W. B. Pritchard, R. C. Shultz, J. A-1. ASCITES: Piquet and Ferrier, Jan- sen, iii. A-42; Frank Allport, E. L. Strode, ii. A-43; Gray, Sainsbury, Roughton, Bradshaw, Cotterill, Kenef- ick, McPatrick, Schamberg, Gaudoin, Treves, Stewart, Terrillon, Ransom, ii. A-44; <i>Archiv für Ohrenheilkunde</i> , <i>Zeitschrift für Ohrenheilkunde</i> , ii. A- 45. DISSEMINATED CEREBRO-SPINAL SCLEROSIS: Hervonot, Déjerine, Mensi, Pitres, Buzzard, Charcot, Grasset, Sou- ques, Oppenheim, Robert, Sandby, Roget, ii. A-63; Pierret, Moncorvo, ii. A-64. LESIONS: Schutz, ii. A-35; Bom- berger, Mayfield, Dana, Collins, Bar- ling, Houghberg, Coats, Mills, Pursor, Goodsell, ii. A-36; Bucklers, Leon d'A- stros, Manasse, ii. A-37; Deucher, Dean, Van Stockum, Banerjee, Phelps, Nor- bury, Sommers, Ryan, Hutchinson, Hardy, Monro, Berry, Marsh, Smart, McLaren, Wilkes, Steiner, ii. A-38; Goodell, Decker, Lewis, Dreschfeld, Hardman, Knaggs and Brown, Crocq, Baginsky, Strümpell, ii. A-39; Bück- lers, Patru, Charcot, Sciamanna, Starr, ii. A-40; Rockwell, Thirioleix and Pas- quier, Paret, Wynne, ii. A-42. LOCALI- ZATION: Goltz, Edinger, ii. A-1; Berkeley, Goltz, Cajal, Kölliker, Anstalt, Mure- toff, ii. A-2; Hiss, Herriek, Andriezen, Stacy Wilson, Ransom, Dana, Mott, Sa- vill, Albertoni, Brigatti, ii. A-3; <i>Lancet</i> , Munk, Ferris, Horsley, Shafter, Moeli and Marinisco, Cavazzani, ii. A-4; Gold- schneider, Cavazzani, ii. A-5; Wedr Mitchell, Horton Prince, Leclercq, Monakov, ii. A-6; Seppilli, Heussen, ii. A-8; Munk, Reinhardt, Ferrier, Nothnagel, Seguin, Monakov, Seppilli, Flechsig, Bechterew, Zacher, ii. A-9. MISCELLANEOUS: Merkel, Rake, Möbius and Wagner, ii. A-65; Clevenger, Clado, Finton, Bremer, Horton Prince, Leclercq, Monakov, ii. A-6; Fournier, Benedikt, Sherrington, Reynolds, Phelps, Ferguson, Buzzard, ii. A-66; ANNUAL 1893, Tschirjew,
and ocular disease.....iv. B-123	ENCEPHALITIS. Leeches and mercury, foll. by <i>iodide of potassium</i> , iii. A-39.	BRAIN, DISEASES—Landon Carter Gray, W. B. Pritchard, R. C. Shultz, J. A-1. ASCITES: Piquet and Ferrier, Jan- sen, iii. A-42; Frank Allport, E. L. Strode, ii. A-43; Gray, Sainsbury, Roughton, Bradshaw, Cotterill, Kenef- ick, McPatrick, Schamberg, Gaudoin, Treves, Stewart, Terrillon, Ransom, ii. A-44; <i>Archiv für Ohrenheilkunde</i> , <i>Zeitschrift für Ohrenheilkunde</i> , ii. A- 45. DISSEMINATED CEREBRO-SPINAL SCLEROSIS: Hervonot, Déjerine, Mensi, Pitres, Buzzard, Charcot, Grasset, Sou- ques, Oppenheim, Robert, Sandby, Roget, ii. A-63; Pierret, Moncorvo, ii. A-64. LESIONS: Schutz, ii. A-35; Bom- berger, Mayfield, Dana, Collins, Bar- ling, Houghberg, Coats, Mills, Pursor, Goodsell, ii. A-36; Bucklers, Leon d'A- stros, Manasse, ii. A-37; Deucher, Dean, Van Stockum, Banerjee, Phelps, Nor- bury, Sommers, Ryan, Hutchinson, Hardy, Monro, Berry, Marsh, Smart, McLaren, Wilkes, Steiner, ii. A-38; Goodell, Decker, Lewis, Dreschfeld, Hardman, Knaggs and Brown, Crocq, Baginsky, Strümpell, ii. A-39; Bück- lers, Patru, Charcot, Sciamanna, Starr, ii. A-40; Rockwell, Thirioleix and Pas- quier, Paret, Wynne, ii. A-42. LOCALI- ZATION: Goltz, Edinger, ii. A-1; Berkeley, Goltz, Cajal, Kölliker, Anstalt, Mure- toff, ii. A-2; Hiss, Herriek, Andriezen, Stacy Wilson, Ransom, Dana, Mott, Sa- vill, Albertoni, Brigatti, ii. A-3; <i>Lancet</i> , Munk, Ferris, Horsley, Shafter, Moeli and Marinisco, Cavazzani, ii. A-4; Gold- schneider, Cavazzani, ii. A-5; Wedr Mitchell, Horton Prince, Leclercq, Monakov, ii. A-6; Seppilli, Heussen, ii. A-8; Munk, Reinhardt, Ferrier, Nothnagel, Seguin, Monakov, Seppilli, Flechsig, Bechterew, Zacher, ii. A-9. MISCELLANEOUS: Merkel, Rake, Möbius and Wagner, ii. A-65; Clevenger, Clado, Finton, Bremer, Horton Prince, Leclercq, Monakov, ii. A-6; Fournier, Benedikt, Sherrington, Reynolds, Phelps, Ferguson, Buzzard, ii. A-66; ANNUAL 1893, Tschirjew,
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DIARRHŒA, INFANTILE, ACUTE (*contin-
ued*).
calomel and lime-water containing a
little *carbolic acid*, ii. K-14. *Atropine*
gr. 1-150 (0.00043 grm.) and *morphe-
a* gr. 1-80 (0.0008 grm.) 2 to 4 times in
34 hours, ii. K-14. *Glycerin of car-
bolic acid* 1 drop every hour, and hy-
poderm. injection gr. 1-30 (0.002 grm.)
morphe, repeated in 2 h. if necessary,
ii. K-14. *Quinia* gr. $\frac{1}{2}$ (0.016 grm.)
dissolved in Mij (0.13 grm.) *sulphuric*
acid, with *tinct. of opium* $\frac{1}{2}$ drop,
tinct. catechu Tly (0.32 grm.), in 1
teaspoonful *chloroform-water*, ii. K-14.
Benzo-naphthol, ii. K-14. *Crocin* 5ss
to j (2 to 4 grms.) to Oj ($\frac{1}{2}$ litre)
sterilized warm water for intestinal
inj. after flushing with warm alkaline
solution, ii. K-15. *Sulpho-carbolate*
of zinc, ii. K-15. Faradic current to
abdomen, ii. K-15. Stomach wash
calomel, irrigation of colon, ii. K-15.
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water with alcohol, and if high temp.
antipyrin. If collapse, warm salt-
water irrig. *calomel* ev. 2 h. in small
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stomach with weak solution *hydro-
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INFECTIOUS. *Carbolic acid*, v. A-22.

WHITE, OF CHINA. Easily-digested food,
for liver *salicilate* of soda and *ipeacac*,
then *dibarbonate* of soda; change of
air, i. D-40, 41.

DIPHTHERIA.

Perchloride of iron, 2 % sol. in *glyc-
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extension from pharynx to larynx, v.
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Oxygenated water loc., v. A-65. *Pet-
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Methylene blue (1 to 9) loc. with swab,
and *pilocarpine* in minute doses int., i.
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foll. by tablesp. *Sedilite salts*; latter,
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breath, i. H-24. *Chronic acid*, 40 %
sol. locally with camel-hair pencil, i.
H-24. *Tannic acid* in *glycerin*, 40 %
sol. loc., and R *Tinct. eucalypti*, 5%
to iiss (3 to 10 grms.); *mucil. amara*,
5ij (90 grms.); *syr. aurantii*, 5j (31
grms.); tablesp. ev. 3 hours, i. H-24.
Spray of *corros. sublimate*, 1 to 1000,
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grms.); R *Bicarbonate of sodium*,
gr. xij (0.8 grm.); *lime-water*, 5ij.
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coat and vest and wear blouse or sheet
in sick-room, and wash face antisept.
bef. leaving, i. H-20. *Eucalypti, car-
bolic acid, cresote, ter.*, etc. Sim-
mering sol. as disinfect. in room,
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	keep bowels open; uric-acid solvents;	
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or leeches over sternum. Para-
dization in threat syncope; *chloral* as
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Subcut. inj. of *infusion of digitalis*,
℥℥ xv to xxx (1 to 2 grms.) 3 t. in 24
hours, v. A-32. *Nerium oleander*, v.
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ARHYTHMIC PALPITATION. *Nerium*
oleander, gr. ii to iij (0.13 to 0.2 gtm.)
per dose, or, for prolonged use, tinct. 10
to 20 drops 2 or 3 t. d., i. B-36; v. A-60.
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atic measures, mod. physical exer-
cise. During infamm. period, absolute
rest in bed, revulsives, milk, *iodide of*
pot., the *salicylates* or *salol*—former
best; *bromides* and *valerian* to quiet
palpitation; *digitalis* useful to make
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oleander, 10 to 20 drops t. d., i. B-36;
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STRANGULATED. Hyp. inj. *morphia* gr.
℥ (0.016 grm.), *atropine* gr. 1-120
(0.0045 grm.), *cocaine* gr. ½ (0.108
grm.) near hernia, rep. ev. 15 m. until
patient comfort.; ev. 5 min. 3 to iv
(62 to 124 grms.) of hot mixture strong
coffee ℥j (500 grammes), fld. ext.
ergot 3j to iv (8 to 16 grms.). IF

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COMPLICATIONS OF.

CARDIAC. Alcohol major import; *caffeine citrate* and *cactus grandiflorus* next in value. *Digitalis* and *strophanthus* useful, *atropine* especially so. In the aged and gouty, *nitroglycerin*. As tonics and chalybeates, *strychnia*, *hypophosphites*, *iron*, *arsenic*, *quinine*, *strychnine*, *codliver-oil*, i. G-18.

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ENDOMETRITIS. Vaginal douche of $\frac{1}{2}$ (30 grms.) common salt to 2 quarts (litres) of water, and alternated irrig. with *corrosive sublimate* and *crocin* sol. twice daily; when secretion abundant, *peroxide of hydrogen*. *Biborate of sodium* locally. If cervix patulous, *camphor-creasote*. Electricity. *Glycerol tampons* with *boroglyceride* 50% or *ichtholol* 15%, ev. other day, altern. with *tinct. iodine* or negative galvanism; drainage, ii. F-82. *Alumina*, 3% sol. for washes; 20% for powders and bougies; 10% as astringent, v. A-3. *Ichtholol* (glycerole 10%) tampon loc. and gr. $\frac{1}{2}$ (0.1 grm.) pills 1 to 6 daily, v. A-1; ii. F-82. *Phenosalyl* as antiseptic, v. A-73.

CHRONIC. Curetting for grave cases; when presence of placental fragments suspected, antiseptic laminaria dilatation, hot-water irrig.; if uterus infect., sol.: R. *Naphthol*, *salol*, *chloral*, aa 5i½ (5 grms.); alcohol, 5viij (250 grms.); water, 1 quart (litre). *Iodoform* or *salol* sponges locally. If uterine membrane has undergone change, sponges cont. *salicylic acid*, gr. xvss. (1 grm.); alcohol, 5iiss (10 grms.); water, q. s. ad 5viij (240 grms.) locally, ii. F-14. *Sulphate-of-copper* crayons, ii. F-15. *Ichtholol*, ii. F-82.

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METRITIS. Cataphoresis, Wallace Briggs's meth., v. D-13.

PARAMETRITIS, POSTERIOR. Besides loc. treatment, careful attention to rectum, ii. F-15. *Ichtholol* or *ichthyolate* of ammonia, ii. F-82.

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UVULA, DISEASES.

HYPERTROPHY. Spray parts with *co-caine* previous to galvano-cautery; pass platinum loop around the appendage, and, as soon as cautery is

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drawn tight by palatine muscles, pull
in an opposite direction with forceps;
make oblique cut, so that raw surface
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INFILTRATION, ACUTE.
If distended and purple, incision
with bistoury, iv. D-54.

VAGINA, DISEASES.

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Cocaine locally. Sexual abstinence.
Introd. of finger into rectum. Elec-
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3,000, once or twice daily; douche with
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BLENNORRHOIC. Methylene blue, v.
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nitrate of silver, gr. xxx (2 grms.) to
5j (31 grms.), and iodoform-gauze
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AXILLARY. Digital pressure; then
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VULVA, DISEASES.

ECZEMA. R. Sodii bicarb., 5j (8 grms.);
pot. bicarb., 5j (4 grms.); glycerine,
5jss (6 grms.); finct. opii, 5j (8
grms.); aq., 5viij (250 grms.). Wash
n. and m. and dust with powder,—2 %
camphor in starch, ii. G-5.

KRAUROSI. Carbolic acid, ii. G-5.

VULVO-VAGINITIS. Vagina washed with
1 % sol. sodii bicarb. of soda; then with
sol. corros. sublimat. 1 to 10,000, iodo-
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593. *Kjobenhavenske medicinske selskabs förhandlingar*, Copenhagen.
594. *Revista veneta di scienze mediche*, Venice.
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596. *Rivista clinica e terapeutica*, Naples.
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608. Revue internationale scientifique et populaire des falsifications des denrées alimentaires, Amsterdam.
609. Archiv für Anatomie und Entwicklungsgeschichte, Leipzig.
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618. Crónica médica de Valencia.
619. Revista médico-farmacéutico de Aragón, Zaragoza.
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629. La medicina preventiva; Gazzetta mensile d'igiene clinica e terapia, Naples.
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633. Revista de laringologia, otologia y rinologia, Barcelona.
634. Revista médica de Sevilla.
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638. Revista médica de Bogotá.
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653. La médecine russe, St. Petersburg.
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656. Revista Brazileira de medicina, Rio de Janeiro.
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739. *Giornale della reale Accademia di medicina, Torino.*
740. *Archiv für Wissenschaften und praktische Thierheilkunde, Leipzig.*
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791. *Γαλλοὺς Ἀθῆναι.*
792. *El Estudio, Mexico.*
793. *Journal of the Quekett Microscopical Club, London.*
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807. Journal für Zahnheilkunde, Berlin.
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812. Biologiska föreningens förhandlingar, Stockholm.
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814. American Medico-Surgical Bulletin, New York.
815. Sanitary World, London.
816. Bollettino della Società fiorentina d'igiene, Florence.
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818. Journal of British and Foreign Health Resorts, London.
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822. Southern Dental Journal, Atlanta.
823. Archivio della riforma medica, Naples.
824. Sheffield Medical Journal, Sheffield, England.
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826. Notes on New Remedies, New York.
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829. Pharmaceutical Journal of Australasia, Sydney, N. S. W.
830. Revista internazionale d'igiene, Naples.
831. Revista de higiene y policia sanitaria, Barcelona.
832. Sbornik lékarský, Praze. Archives bohêmes de médecine.
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834. La psichiatria, Naples.
835. Revista de medicina dosimetrica, Madrid.
836. Annalen der Physik und Chemie, Leipzig.
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842. Journal of the British Dental Association, London.
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844. Oesterr-ungar. Centralblatt für die medicinischen Wissenschaften, Vienna.
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855. Modern Medicine and Bacteriological World, Battle Creek, Mich.
856. Western Medical and Surgical Reporter, St. Joseph, Mo.
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858. Johns Hopkins Hospital Reports, Baltimore.
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884. Tidskrift i militär Helsovård, Stockholm.
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907. Revista clinica de los hospitales, Madrid.
908. Bulletin de la Société de chirurgie, Paris.
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918. Archivos internacionales de laringologia, otologia, rinologia, Barcelona.
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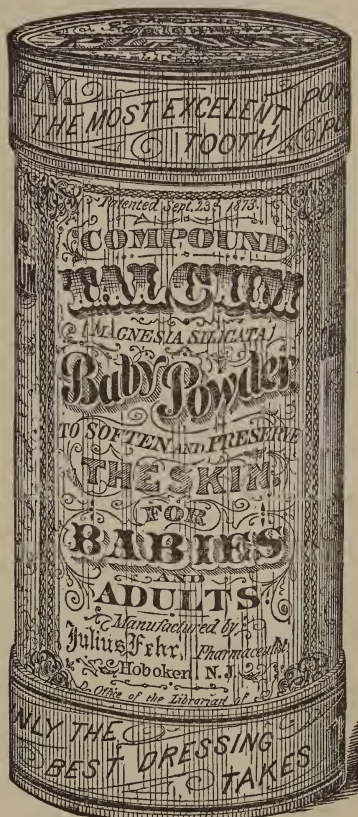
The following excerpt from an article under the above caption, in the *Virginia Medical Monthly*, by Stephen J. Clark, M.D., No. 66 W. Tenth Street, of this city, plainly outlines the useful combination of two leading remedies in *materia medica*:—

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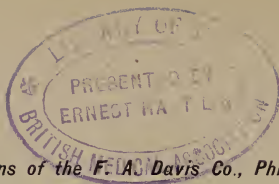
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